AUTHENTICATED
U.S. GOVERNMENT
INFORMATION
GPO

S. HRG. 113–739

OVERSIGHT HEARING ON DOMESTIC RENEWABLE FUELS

JOINT HEARING

BEFORE THE

SUBCOMMITTEE ON CLEAN AIR AND NUCLEAR SAFETY

OF THE

COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS
UNITED STATES SENATE

AND THE

COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS
UNITED STATES SENATE

ONE HUNDRED THIRTEENTH CONGRESS

FIRST SESSION

DECEMBER 11, 2013

Printed for the use of the Committee on Environment and Public Works

Available via the World Wide Web: http://www.gpo.gov/fdsys

OVERSIGHT HEARING ON DOMESTIC RENEWABLE FUELS

S. HRG. 113–739

OVERSIGHT HEARING ON DOMESTIC RENEWABLE FUELS

JOINT HEARING

BEFORE THE

SUBCOMMITTEE ON CLEAN AIR AND NUCLEAR SAFETY

OF THE

COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS UNITED STATES SENATE

AND THE

COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS UNITED STATES SENATE

ONE HUNDRED THIRTEENTH CONGRESS

FIRST SESSION

DECEMBER 11, 2013

Printed for the use of the Committee on Environment and Public Works

Available via the World Wide Web: http://www.gpo.gov/fdsys

U.S. GOVERNMENT PUBLISHING OFFICE

96–025 PDF WASHINGTON : 2015

For sale by the Superintendent of Documents, U.S. Government Publishing Office
Internet: bookstore.gpo.gov Phone: toll free (866) 512–1800; DC area (202) 512–1800
Fax: (202) 512–2104 Mail: Stop IDCC, Washington, DC 20402–0001

COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS

ONE HUNDRED THIRTEENTH CONGRESS
FIRST SESSION

BARBARA BOXER, California, *Chairman*

MAX BAUCUS, Montana
THOMAS R. CARPER, Delaware
BENJAMIN L. CARDIN, Maryland
BERNARD SANDERS, Vermont
SHELDON WHITEHOUSE, Rhode Island
TOM UDALL, New Mexico
JEFF MERKLEY, Oregon
KIRSTEN GILLIBRAND, New York
CORY A. BOOKER, New Jersey

DAVID VITTER, Louisiana
JAMES M. INHOFE, Oklahoma
JOHN BARRASSO, Wyoming
JEFF SESSIONS, Alabama
MIKE CRAPO, Idaho
ROGER WICKER, Mississippi
JOHN BOOZMAN, Arkansas
DEB FISCHER, Nebraska

BETTINA POIRIER, *Majority Staff Director*
ZAK BAIG, *Republican Staff Director*

SUBCOMMITTEE ON CLEAN AIR AND NUCLEAR SAFETY

THOMAS R. CARPER, Delaware, *Chairman*

MAX BAUCUS, Montana
BENJAMIN L. CARDIN, Maryland
BERNARD SANDERS, Vermont
SHELDON WHITEHOUSE, Rhode Island
TOM UDALL, New Mexico
BARBARA BOXER, California *(ex officio)*

JEFF SESSIONS, Alabama
JOHN BARRASSO, Wyoming
MIKE CRAPO, Idaho
ROGER WICKER, Mississippi
JOHN BOOZMAN, Arkansas
DAVID VITTER, Louisiana *(ex officio)*

C O N T E N T S

Page

DECEMBER 11, 2013

OPENING STATEMENTS

Boxer, Hon. Barbara, U.S. Senator from the State of California 1
Vitter, Hon. David, U.S. Senator from the State of Louisiana 2
Cardin, Hon. Benjamin L., U.S. Senator from the State of Maryland 57
Barrasso, Hon. John, U.S. Senator from the State of Wyoming 61
Fischer, Hon. Deb, U.S. Senator from the State of Nebraska 67
Inhofe, Hon. James M., U.S. Senator from the State of Oklahoma 68
Wicker, Hon. Roger, U.S. Senator from the State of Mississippi 70
Carper, Hon. Thomas R., U.S. Senator from the State of Delaware 71
Whitehouse, Hon. Sheldon, U.S. Senator from the State of Rhode Island 72
Sessions, Hon. Jeff, U.S. Senator from the State of Alabama 73
Udall, Hon. Tom, U.S. Senator from the State of New Mexico, prepared statement 141

WITNESSES

Grundler, Christopher, Director, Office of Transportation and Air Quality, Office of Air and Radiation, U.S. Environmental Protection Agency 74
Prepared statement 76
Responses to additional questions from:
Senator Boxer 86
Senator Baucus 88
Senator Carper 90
Senator Cardin 92
Senator Gillibrand 98
Senator Vitter 99
Senator Wicker 102
Senator Fischer 104
Chalk, Steven, Deputy Assistant Secretary for Renewable Power, U.S. Department of Energy 106
Prepared statement 108
Responses to an additional question from:
Senator Boxer 113
Senator Carper 114
Responses to additional questions from:
Senator Cardin 115
Senator Fischer 124
Clark, General Wesley K. (Retired), Co-Chairman, Growth Energy 145
Prepared statement 147
Responses to additional questions from:
Senator Boxer 167
Senator Cardin 168
Senator Vitter 169
Response to an additional question from Senator Wicker 171
Collins, James C., Jr., Senior Vice President, DuPont Polymers and Industrial Biosciences, E.I. DuPont de Nemours and Company, Inc. 173
Prepared statement 175
Drevna, Charles T., President, American Fuel and Petrochemical Manufacturers 199
Prepared statement 201
Response to an additional question from Senator Carper 216

Page

Drevna, Charles T., President, American Fuel and Petrochemical Manufacturers—Continued
Responses to additional questions from:
Senator Gillibrand ... 217
Senator Vitter ... 219
Senator Barrasso ... 223
Holzfaster, Jon, Owner and Operator, Holzfaster Farm ... 225
Prepared statement ... 227
Response to an additional question from Senator Vitter ... 236
Faber, Scott, Senior Vice President for Government Affairs, Environmental Working Group ... 237
Prepared statement ... 239
Responses to additional questions from Senator Cardin ... 246
Response to an additional question from Senator Vitter ... 250
Responses to additional questions from Senator Barrasso ... 251
Response to an additional question from Senator Wicker ... 253
Coleman, Brooke, Executive Director, Advanced Ethanol Council ... 254
Prepared statement ... 256
Responses to additional questions from:
Senator Boxer ... 273
Senator Carper ... 280
Senator Cardin ... 286
Response to an additional question from Senator Gillibrand ... 292
Responses to additional questions from Senator Vitter ... 294

ADDITIONAL MATERIAL

LETTERS

Open letter to Congress, Eliminate the Corn Ethanol Mandate, from ActionAid USA et al. ... 384
Letter to Senators Barbara Boxer and David Vitter from ActionAid USA et al. ... 385
Letter to Wayne Allard, American Motorcyclist Association, from the Air Resources Board ... 387
Letter to Representatives Ralph Hall and Eddie Bernice Johnson from the Alliance of Automobile Manufacturers et al. ... 389
Letters to Senator John Barrasso from:
American Frozen Food Institute ... 390
American Highway Users Alliance ... 392
Americans for Prosperity ... 393
National Boating Federation ... 394
National Marine Manufacturers Association ... 395
Letter to Senators John Barrasso, Mark Pryor, and Pat Toomey from the National Taxpayers Union ... 396
Letter to Adam Sieminski, U.S. Energy Information Administration, from Senator David Vitter ... 397

PRESS RELEASES

American Bakers Association, Bakers Continue Pressing for Changes to the Corn-Based Ethanol Program ... 400
American Fuel & Petrochemical Manufacturers, AFPM Endorses Renewable Fuel Standard Repeal Act ... 401
American Lamb Council et al., Sheep Industry Joins Sen. Barrasso in Move To Repeal Renewable Fuels Standard ... 403
American Petroleum Institute, API welcomes bipartisan Senate proposal to end unworkable biofuels mandate ... 404
Growth Energy, Clark: Foreign Oil Threatens America's National Security ... 406
National Cattlemen's Beef Association, Livestock and Poultry Groups Urge Congress to Repeal the Renewable Fuel Standard ... 408
National Cattlemen's Beef Association et al., Livestock and Poultry Groups Urge Congress to Repeal the Renewable Fuel Standard ... 410
National Chicken Council, Livestock and Poultry Groups Urge Congress to Repeal the Renewable Fuel Standard ... 411
National Council of Chain Restaurants, National Council of Chain Restaurants Lauds Senate RFS Repeal Bill ... 412

Page

Wyoming Petroleum Marketers Association, Wyoming Petroleum Marketers Support Barrasso Bill Repealing Renewable Fuel Standard 414

ARTICLES

ActionAid USA, Biofuels, Food Security and Land Grabs 416
Financial Times, The US must halt biofuel production to prevent a food crisis 418
Food and Agriculture Organization of the United Nations, Biofuel development should not compromise food security, says CFS 420
Proceedings of the National Academy of Sciences, Recent land use change in the Western Corn Belt threatens grasslands and wetlands 422
Rolling Stone, The Ethanol Scam 430
USA Today, The Editorial Board, Ethanol quotas pump money from your pocket: Our view 435
The Wall Street Journal, Review and Outlook, Big Ethanol Finally Loses 437
The Washington Post, Editorial Board, Ethanol takes policy blow from the Environmental Protection Agency 439

STATEMENTS

The Alliance of Automobile Manufacturers 441
The Association of Equipment Manufacturers 449
The Society of Independent Gasoline Marketers of America and the National Association of Convenience Stores 453

REPORTS

ActionAid International USA, Biofueling Hunger: How US Corn Ethanol Policy Drives Up Food Prices in Mexico 462
Committee on World Food Security, 40th Session, Rome, Italy, 7–11 October 2013 477
National Renewable Energy Laboratory, High Ethanol Fuel Endurance: A Study of the Effects of Running Gasoline with 15% Ethanol Concentration in Current Production Outboard Four-Stroke Engines and Conventional Two-Stroke Outboard Marine Engines 497

MISCELLANEOUS

Approximate schedule for December 5 RFS hearing 552

OVERSIGHT HEARING ON DOMESTIC RENEWABLE FUELS

WEDNESDAY, DECEMBER 11, 2013

U.S. SENATE,
COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS,
SUBCOMMITTEE ON CLEAN AIR AND NUCLEAR SAFETY,
COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS,
Washington, DC.

The Committees met, pursuant to notice, at 9 a.m. in room 406, Dirksen Senate Office Building, Hon. Barbara Boxer (chairman of the full Committee) presiding.

Present: Senators Boxer, Vitter, Carper, Sessions, Cardin, Whitehouse, Udall, Merkley, Inhofe, Barrasso, Crapo, Wicker, Boozman, and Fischer.

OPENING STATEMENT OF HON. BARBARA BOXER, U.S. SENATOR FROM THE STATE OF CALIFORNIA

Senator BOXER. The hearing of the EPW Oversight Hearing on Domestic Renewable Fuels will come to order. We changed the time, I really appreciate everybody's cooperation, out of respect for a memorial service for Nelson Mandela.

We are going to end this hearing at 11 a.m. So, I am going to be tough with the gavel, ask everybody to do a 3-minute opening statement, and you can stick to your 5 but I will use a hard gavel. So, after members, wherever we are at 10:15 a.m., we will call up the second panel so that we will have adequate time to hear from them.

This oversight hearing is going to focus on the critically important Renewable Fuels Standard Program and EPA's recent 2014 renewable fuel volumes. Congress created the RFS to promote a strong domestic renewable energy industry, reduce our dependence on foreign oil and cut dangerous emissions of carbon.

In 2005, Congress established the program and set goals for the use of renewable fuels and in 2007 we expanded these goals and called for the increased use of renewable fuels such as cellulosic ethanol and advanced biofuels which can turn waste into fuel. The RFS is designed to promote the use of renewable fuels as transportation or jet fuel and home heating oil.

The requirement to increase the use is designed to provide a clear and consistent market demand for these fuels. Congress also designed the RFS to be managed in a flexible way. So, the EPA issues rules to set annual volumes. It is important to note that the RFS uses tradable credits, or RINs, for each gallon of renewable biofuel produced in or imported into the United States. So, petro-

leum companies can buy biofuel and obtain the RINs to demonstrate their compliance.

So, it is a flexible program. And, according to the EPA, by 2022 the RFS will displace over 13 billion gallons of gas and diesel, cut oil imports by more than $41 billion and reduce carbon pollution by 138 million metric tons.

I think those are exactly the kinds of goals our country should be focused on, energy independence by expanding domestic production of renewable fuels and reducing dangerous pollution. And President Obama has recognized the importance of the RFS and he said "Biofuels have an important role to play in increasing our energy security, fostering rural economic development and reducing greenhouse gas emissions from the transportation sector."

I certainly agree with that statement. Advanced and cellulosic biofuels play a very important role in the RFS. And I personally believe that the Federal Government should promote their use.

This industry got started during the most severe economic downturn in our Nation's history and now, with sustained commitment to support renewable fuels, EPA projects that five companies in the U.S. will produce commercial scale cellulosic ethanol by 2014. And we know that several other companies are working to construct commercial scale cellulosic ethanol plants in 2015 and beyond.

So, I am looking forward to this oversight hearing, to hearing from you on how this, how the new volumes effect you, whether you think it was a fair role for the EPA to play. And I think we have a lot to learn about this. But to me, the fundamental point is we need to be energy independent. We need to clean up the air, get dangerous carbon pollution out of the air. Those things say to me, we are on the right track.

With that, I will call on Senator Vitter.

OPENING STATEMENT OF HON. DAVID VITTER, U.S. SENATOR FROM THE STATE OF LOUISIANA

Senator VITTER. Thank you, Chairman Boxer, for convening today's hearing. And I also want to thank our witnesses for being here as well. Unfortunately not invited were many significant stakeholders like poultry producers, food products manufacturers, boat owners, motorcycle enthusiasts, small engine manufacturers, biodiesel producers, gas station owners, conservation groups. But many of these groups have sent letters and so I would ask unanimous consent that they be included in the record.

Senator BOXER. Absolutely.

[The referenced information follows:]

NATIONAL
CHICKEN
COUNCIL

1152 FIFTEENTH STREET NW, SUITE 430
WASHINGTON, DC 20005
PHONE: 202-296-2622
FAX: 202-293-4005

December 11, 2013

Ms. Barbara Boxer
Chairwoman
U.S. Senate Committee on
Environment & Public Works
U.S. Senate
410 Dirksen Senate Office Building
Washington, DC 20510-6175

Re: Oversight Hearing on Domestic Renewable Fuels

Dear Madam Chairwoman:

The National Chicken Council (NCC) is pleased to present this testimony before the Senate Committee on Environment and Public Works and the Subcommittee on Clean Air and Nuclear Safety in the hearing entitled, "Oversight Hearing on Domestic Renewable Fuels." The nation's energy and agricultural policies are essential to the strength of our nation, the vigor of our agricultural industries, and the well-being of our citizens, and we greatly appreciate the Committee's interest in reevaluating the Renewable Fuel Standards (RFS) program and our nation's biofuels policy. We have reached a critical juncture with the RFS biofuels mandate, and NCC strongly believes that now is the time for Congress to comprehensively reform the program to ensure that conventional renewable fuels are not pursued at the expense of our nation's basic food supply.

NCC is the national trade association representing vertically integrated companies that produce, process, and market over 95 percent of the chicken in the United States. In addition, NCC members include allied industry firms that supply necessary inputs and services for the chicken industry. As part of the subgroup of corn users who absorb all of the costs imposed by the RFS, NCC's members have significant experience with the marketplace distortions caused by the RFS.

As we explained in great detail in comments submitted to the Environmental Protection Agency (EPA) in October 2012 in support of issuing a waiver of the ethanol blending requirement to relieve immense price pressure on the nation's drought-stricken corn supply, U.S.-grown corn is a crucial element in the nation's food and feed supply, as well as in the global economy. Corn is integral to the U.S. food supply, and approximately 75 percent of foods on grocery store shelves—including chickens—contain corn or involve corn in their supply chain. Corn is the primary element of chicken feed, and feed costs represent the highest cost component of producing chicken. When corn becomes more expensive, so does the food people buy, including chicken.

The RFS necessarily drives up the price of corn by requiring the nation's corn supply to support two industries—food production and RFS-mandated ethanol production. Before the RFS, about 15 percent of the nation's corn supply was used for ethanol production. Under the RFS, 40 percent of the nation's corn supply now gets diverted to ethanol production annually, and the blending targets require it be used in increasing quantities, regardless of cost. The food industry is left to make do with the remaining 60 percent of the corn, which drives up corn prices substantially. As of last October, corn prices have more than doubled since the RFS was implemented, the cost of cereals, meat, and poultry was up more than 75 percent, and corn price volatility—a very important factor for raising animals that require planning months and years in advance—has been up dramatically since the RFS was implemented. Ultimately, American consumers and the nation's food producers—including chicken companies, the hard-working rural Americans employed by the industry, and the family farmers who raise the chickens—pay the steep price imposed by the RFS. Escalating food prices are especially devastating for the millions of low-income Americans still struggling to regain their economic footing and for whom more expensive food all too often means less food.

In short, the RFS conventional ethanol-blending requirement stretches the nation's corn supply too thin and forces consumers to pay more at the grocery store register for little-to-no benefits at the gas pump.

The RFS's ethanol-blending requirements are problematic in other ways. The nation has reached the blend wall, the point at which the nation's fuel supply has become saturated with ethanol. By law, and by the way automobile engines are engineered, only so much ethanol can be blended into the fuel supply. Any ethanol produced over that amount is useless for motor fuel. Factoring in serious questions about ethanol's efficiency as a motor fuel, the overall cost of creating corn-based ethanol, and real concerns about the net environmental impacts of the full production lifecycle for fuel-grade conventional ethanol, all evidence points to reconsidering the RFS.

The EPA's recent proposal to reduce the 2014 ethanol blending targets, while a step in the right direction, is only a modest tweak of the existing system. Even if EPA finalizes its proposed reduced targets, billions of bushels of corn will still be diverted to ethanol use, corn prices will remain artificially high, and consumers will continue to struggle with high food prices. Instead of small fixes based on projected corn production constantly clouded in uncertainty, it is time for Congress to fix the RFS.

NCC strongly believes Congress should comprehensively reform the RFS to align its goal of fostering clean, renewable energy with the equally important need to ensure a robust American food industry and an affordable supply of food for all Americans. Any comprehensive reform must include eliminating the conventional ethanol-blending requirements. The conventional ethanol requirements' unintended consequences on food prices have more than outweighed any marginal benefit to the fuel supply. Moreover, conventional ethanol has always been but a stepping-stone to the RFS's ultimate goals of advanced biofuels and cellulosics. The nation cannot possibly produce enough corn to fuel the American motor fleet, car engines could not run on it in any event, and advanced fuels hold much more promise for achieving energy independence and sustainability.

Congress can revamp the RFS to focus the program on fostering long-term research and development of these more advanced fuel sources, fuel sources that will not compete with such a fundamental necessity as the nation's food supply. With close to a decade of blending targets under the RFS, the ethanol-refining industry has matured to the point where market forces should be left to dictate how best to use the corn supply. If corn-based ethanol is an efficient fuel source, blenders will continue to use it even after reform to the RFS. If it is not, corn production will return to more efficient production levels, and farmers will transition land currently devoted to excess corn production to other sources of food or better agricultural biofuels. The result will be more affordable food prices, more reasonable biofuels energy policy, and more focus on long-term solutions to energy sustainability.

Thank you for your consideration and for the Committee's interest in the significant effects the nation's biofuels policy is having on the American food industry. Please do not hesitate to contact me if NCC can provide any additional information.

Respectfully submitted,

Michael J. Brown
President

December 11, 2013

The Honorable Barbara Boxer
United States Senate
Washington, DC 20510

The Honorable David Vitter
United States Senate
Washington, DC 20510

Dear Chairman Boxer and Ranking Member Vitter:

We, the undersigned diverse array of agriculture, business, environment, food retail, hunger, taxpayer, and public interest and consumer groups, commend the Senate Environment and Public Works Committee for holding a hearing to conduct oversight of the Renewable Fuel Standard (RFS). We write today to share our support for meaningful Congressional action to address the myriad of issues with the RFS program. However, we do want to draw the committee's attention to our disappointment in the lack of including critical stakeholders in your hearing process. Given the significant interest in the RFS, we think the Committee missed a great opportunity to include a robust panel that would fully illustrate the daily realities and diverse impacts of this policy on so many sectors of the population.

While our reasons vary, all of us have long maintained that the RFS is a uniquely flawed policy. The mandate on corn-based ethanol in particular has had a devastating effect on the entire food economy from livestock and poultry producers facing record feed costs, to food retailers facing record food costs, to consumers struggling to balance food budgets in tough economic times. Some signers of this letter also question the propriety of Congress establishing production quota and guaranteed market shares for any type of commercial business. Ethanol from corn also is concerning to some due to its global warming impact and the use of natural resources such as water and native grassland for producing fuel. The corn-based ethanol mandate is also having a devastating impact in communities throughout the world, where people living in poverty are facing increased food prices that threaten their food and land security.

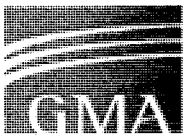
Corn ethanol has cost taxpayers billions of dollars in tax credits, tariffs, and other subsidies over the past thirty years; while the most expensive tax credit – the Volumetric Ethanol Excise Tax Credit - expired at the end of 2011, ethanol subsidies live on through farm bill energy title programs and other federal incentives. All of these concerns are in addition to concerns over higher blends of ethanol in the fuel system that have created significant safety and liability problems with boats, recreation and lawn equipment, as well as motorcycles and legacy vehicles.

Although the problems created by the RFS in terms of RINs and the approaching "blend wall" are significant and need to be addressed, so too do the problems the RFS imposes on the food chain, consumers, taxpayers, and the environment. Indeed, although EPA's recent proposal to freeze ethanol blending targets is a step in the right direction, it does not address the multitude of other issues with the RFS and should be a signal it is time for Congress to take the difficult steps needed toward real reform. Our organizations strongly support Congressional action to enact significant, meaningful and permanent decreases in the conventional biofuels (corn ethanol) mandate and other reforms as needed.

Thank you for considering these views.

Sincerely,

ActionAid USA
American Meat Institute
American Sportfishing Association
American Bakers Association
Boat U.S.
California Dairy Campaign
Clean Air Task Force
Dairy Producers of New Mexico
Dairy Producers of Utah
Friends of the Earth
Idaho Dairymen's Association
Milk Producers Council
National Council of Chain Restaurants
National Taxpayers Union
National Turkey Federation
Nevada State Dairy Commission
Northwest Dairy Association / Darigold
Oregon Dairy Farmers Association
Oxfam America
Southeast Milk, Inc.
Specialty Equipment Market Association
Washington State Dairy Federation



December 11, 2013

Chairman Barbara Boxer
Senate Environment and Public Works Committee
410 Dirksen Senate Office Building
Washington, DC 20510

Ranking Member David Vitter
Senate Environment and Public Works Committee
456 Dirksen Senate Office Building
Washington, DC 20510

Dear Chairman Boxer and Ranking Member Vitter:

The Grocery Manufacturers Association[1] (GMA) appreciates this opportunity to submit comments in advance of the Senate Environment and Public Works Committee's hearing titled "Oversight Hearing on Domestic Renewable Fuels." We were pleased that the Environmental Protection Agency (EPA) proposed 2014 Renewable Volume Obligations reduced the corn ethanol mandate, as well as the level of advanced biofuels. Since the Renewable Fuels Standard (RFS) was enacted in 2007, market dynamics are far different than anticipated. Consequently, we believe it is time for Congress to adjust the RFS.

When the RFS targets were created in the Energy Security and Independence Act of 2007 (ESIA), it was thought that cellulosic ethanol production would ramp up quickly and consumer demand for gasoline would continue to increase. These conditions have not come to pass and, specifically, biodiesel has been required to fulfill an increasingly large portion of the advanced biofuels RFS. In 2013, 70% of the advanced RFS was to be met with biodiesel, of which 65% was edible oils, such as soy and canola. Only .004% of the mandate is being fulfilled by cellulosic. Because edible oils are ubiquitous in the food supply, the impact of this policy on soybean oil prices has been dramatic. Since 2007, the price per pound of soyoil has risen dramatically with each 10 cent increase equating to a $2 billion increase in the cost of food production.

Although EPA's 2014 proposal provides some relief to our industry, the situation becomes more challenging as the statutory levels of advanced biofuels increase in the coming years. Currently 25%, or 5 billion pounds, of soyoil produced each year goes to biodiesel. If the targets contained in ESIA are maintained, by 2016, the U.S. will need to produce over 29.3 billion pounds of soybean oil simply to fulfill the advanced biofuels RFS, which does not include the amount needed for food uses. This amount is 150% of current production. If this occurs, the U.S. could be put in a position where it has to import

[1] Based in Washington, D.C., GMA is the voice of more than 300 leading food, beverage and consumer product companies that sustain and enhance the quality of life for hundreds of millions of people in the United States and around the globe.

Founded in 1908, GMA is an active, vocal advocate for its member companies and a trusted source of information about the industry and the products consumers rely on and enjoy every day. The association and its member companies are committed to meeting the needs of consumers through product innovation, responsible business practices and effective public policy solutions developed through a genuine partnership with policymakers and other stakeholders.

In keeping with its founding principles, GMA helps its members produce safe products through a strong and ongoing commitment to scientific research, testing and evaluation and to providing consumers with the products, tools and information they need to achieve a healthy diet and an active lifestyle.

The food, beverage and consumer packaged goods industry in the United States generates sales of $2.1 trillion annually, employs 14 million workers and contributes $1 trillion in added value to the economy every year.

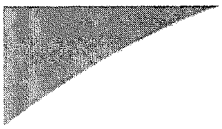
foreign soybean oil to meet its domestic food needs, simply to support its renewable energy policy. Under these circumstances, it is not hard to imagine a rise in the price of soybean oil, which could result in increases in costs for manufacturers and in prices consumers pay.

As Congress considers legislative solutions, it is important that RFS reform take a comprehensive approach. Adjusting the corn ethanol mandate without addressing biodiesel could result in shifting of acreage between corn and soybeans. If this happens, the benefits of reforming the corn ethanol RFS could be limited.

We appreciate the Committee's willingness to undertake an examination of the Renewable Fuels Standard and look forward to working with you on a policy solution that reflects current market conditions and mitigates the negative impacts of the biodiesel and advanced biofuels mandates.

Sincerely,

Louis Finkel
Executive Vice President, Government Affairs



December 10, 2013

The Honorable Barbara Boxer
Chairman
Environment and Public Works Committee
United States Senate
112 Hart Senate Office Building
Washington D.C., 20510

The Honorable David Vitter
Ranking Member
Environment and Public Works Committee
United States Senate
516 Hart Senate Office Building
Washington D.C., 20510

RE: "Oversight Hearing on Domestic Renewable Fuels"—Hearing in the U.S. Senate Committee on Environment and Public Works and the Subcommittee on Clean Air and Nuclear Safety

Dear Chairman Boxer and Senator Vitter:

The Clean Air Task Force (CATF) is a non-profit environmental organization that works to protect the earth's atmosphere by improving air quality and reducing global climate change through scientific research, public advocacy, technological innovation, and private sector collaboration. In advance of the hearing on domestic renewable fuels being held by the Committee on Environment and Public Works and the Subcommittee on Clean Air and Nuclear Safety, CATF is pleased to share our analysis of the climate impacts associated with the Renewable Fuel Standard (RFS).

This letter briefly outlines CATF's concerns about the effect that the RFS-mandated scale-up of corn ethanol consumption is having on net greenhouse gas emissions, and how the RFS's negative climate impact can be reduced going forward. The points made in this letter echo several suggestions that CATF's offered in response to the RFS Assessment White Papers that the House of Representatives Energy and Commerce Committee circulated earlier this year.[1,2]

In short, the corn ethanol being produced in compliance with the RFS and the Energy Independence and Security Act of 2007 (EISA) produces more greenhouse gas (GHG) over a 30-year lifecycle than the gasoline it displaces (on an energy-equivalent basis). The

assumption that GHG reductions achieved by other biofuels, such as ethanol made from cellulosic feedstocks, would offset the corn ethanol-driven increases looks increasingly unwarranted as it becomes clear that the commercialization of cellulosic biofuels will happen more slowly and on a smaller scale than expected. As a result, in order to improve the RFS's impact on climate change in the near term, Congress and the Environmental Protection Agency (EPA) must work together to scale back the production of corn ethanol and other conventional biofuels, while opening up market opportunities for cleaner fuels.

Net Increases in GHG Emissions Caused by the RFS

EISA requires that gasoline "sold or introduced into commerce in the United States" contains 36 billion gallons of biofuel by 2022. Much of that requirement—21 billion gallons by 2022—is to be met by various "advanced biofuels," a category which includes cellulosic biofuels that are shown to reduce lifecycle greenhouse gas (GHG) emissions by at least 60% when compared to gasoline, as well as biodiesel and other biofuels that achieve 50% reductions.

To date, though, the RFS has largely amounted to a mandate for corn ethanol. Corn ethanol has accounted for more than 90% of the fuel by volume that has been mandated under the RFS since 2006, and will account for 83% of the mandated volume this year. Corn ethanol is poised to maintain its dominant role in the RFS going forward as well, as cellulosic biofuels struggle to reach commercial scale and further expansion of "advanced biofuels" like sugarcane ethanol and soy biodiesel is complicated by market- and environment-related constraints.

EISA's implied corn ethanol mandate grows from 10.5 billion gallons per year in 2010 to 15 billion gallons in 2015. From 2015 to 2022, no more than 15 billion gallons of corn ethanol can be used to satisfy the RFS's annual volume requirements, absent a special showing by the Agency. Consequently, corn ethanol produced during 2010-2015 (while production capacity is still ramping up) has much higher lifecycle emissions than corn ethanol produced in 2022 (seven years after production of corn ethanol is supposed to level off).

EPA, for reasons it never adequately justified, chose to regulate all corn ethanol production according to the lifecycle GHG emissions analysis it did for corn ethanol produced in 2022 – even though it had also calculated the lifecycle greenhouse gas emissions for corn ethanol produced in 2012 and 2017. The chart below, which EPA placed in the RFS implementation rule docket but never referenced,[3] lists 33 different ways to produce corn ethanol (each of which was modeled by EPA), and shows how the lifecycle GHG emissions in 2012, 2017, and 2022 for each production method compare to the lifecycle emissions from gasoline. The corn ethanol production pathways that result in the same or higher lifecycle GHG emissions than gasoline are shaded in dark gray. The pathways that achive lower lifecycle GHG emissions than gasoline but still fall short of EISA's 20% reduction requirement are shaded in light gray.

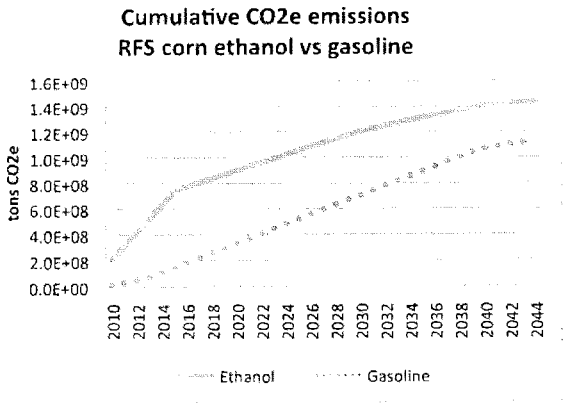
	2012	2017	2022
Dry Mill NG (dry DDGS)	33%	10%	-17%
w/ CHP (dry DDGS)	30%	7%	-20%
w/ CHP and Fractionation (dry DDGS)	28%	5%	-22%
w/ CHP, Fractionation and Membrane Separation (dry DDGS)	24%	1%	-25%
w/ CHP, Fractionation, Membrane Separation, and Raw Starch Hydr	19%	-4%	-30%
Dry Mill NG (wet DGS)	21%	-2%	-27%
w/ CHP (wet DGS)	17%	-5%	-30%
w/ CHP and Fractionation (wet DGS)	19%	-4%	-29%
w/ CHP, Fractionation and Membrane Separation (wet DGS)	15%	-8%	-33%
w/ CHP, Fractionation, Membrane Separation, and Raw Starch Hydr	12%	-10%	-36%
Dry Mill Coal (dry DDGS)	66%	41%	12%
w/ CHP (dry DDGS)	64%	39%	10%
w/ CHP and Fractionation (dry DDGS)	56%	31%	3%
w/ CHP, Fractionation and Membrane Separation (dry DDGS)	47%	22%	-5%
w/ CHP, Fractionation, Membrane Separation, and Raw Starch Hydr	36%	13%	-14%
Dry Mill Coal (wet DGS)	41%	17%	-10%
w/ CHP (wet DGS)	39%	15%	-12%
w/ CHP and Fractionation (wet DGS)	37%	14%	-13%
w/ CHP, Fractionation and Membrane Separation (wet DGS)	28%	5%	-21%
w/ CHP, Fractionation, Membrane Separation, and Raw Starch Hydr	22%	-1%	-26%
Dry Mill Biomass (dry DDGS)	6%	-15%	-40%
w/ CHP (dry DDGS)	-2%	-23%	-47%
w/ CHP and Fractionation (dry DDGS)	0%	-21%	-45%
w/ CHP, Fractionation and Membrane Separation (dry DDGS)	1%	-20%	-45%
w/ CHP, Fractionation, Membrane Separation, and Raw Starch Hydr	0%	-21%	-45%
Dry Mill Biomass (wet DGS)	6%	-16%	-41%
w/ CHP (wet DGS)	-3%	-24%	-48%
w/ CHP and Fractionation (wet DGS)	0%	-21%	-46%
w/ CHP, Fractionation and Membrane Separation (wet DGS)	0%	-21%	-45%
w/ CHP, Fractionation, Membrane Separation, and Raw Starch Hydr	0%	-21%	-46%
Wet Mill with NG	37%	17%	-7%
Wet Mill with coal	64%	43%	19%
Wet Mill with biomass	-3%	-24%	-48%

As EPA's chart shows, only three of the 33 modeled pathways result in lower emissions than gasoline in 2012. The story improves in 2017, but not dramatically: 15 of the 33 pathways produce emissions that are higher than those from gasoline and only nine of the pathways achieve the 20% reduction required by EISA.

Given that EPA had conducted lifecycle GHG emission analyses for 2012 and 2017 that more accurately modeled corn ethanol's actual (rather than hypothetical) environmental performance, CATF and other environmental organizations questioned the Agency's decision to rely on the 2022 analysis. The National Research Council raised the same concern in a 2011 report, when it wrote,

> EPA found corn-grain ethanol, regardless of whether the coproduct is sold wet or dry, to have life-cycle GHG emissions higher than gasoline in 2012 or 2017 unless it is produced in a biorefinery that uses biomass as a heat source. EPA calculated its 21-percent GHG reduction as a weighted average of projected biorefinery and corn production efficiencies that could be realized in 2022. Thus, according to EPA's own estimates, corn-grain ethanol produced in 2011, which is almost exclusively made in biorefineries using natural gas as a heat source, is a higher emitter of GHG than gasoline. Nevertheless, corn-grain ethanol produced at the time this report was written still qualified for RFS2 based upon EPA's industry-weighted average of projected 2022 industry. The discrepancy between how RFS2 is implemented (under the assumption of 21-percent reduction of GHG emissions by corn-grain ethanol compared to gasoline) and EPA's own analysis *suggests that RFS2 might not achieve the intended GHG reductions.*[4]

In fact, the RFS does *not* achieve the intended GHG reductions. Using the 30-year lifecycle analysis that EPA conducted for corn ethanol produced in 2012 (instead of the analysis for 2022), CATF calculated the cumulative lifecycle GHG emissions from corn ethanol produced during the ramp-up period (2010-2015). CATF carried its analysis though 2044 to capture a full 30 years of emissions from each year-class of new ethanol (*i.e.*, the 30-year lifecycle for ethanol produced in 2015 ends in 2044). In 2044, cumulative GHG emissions from corn ethanol equal about 1.4 billion tons; the emissions from an energy equivalent amount of gasoline equal 1.1 billion tons. In other words, the cumulative lifecycle GHG emissions from corn ethanol are 28% higher than those from gasoline.



CATF's full analysis of EPA's lifecycle GHG emissions data can be found in a 2013 white paper titled "Corn Ethanol GHG Emissions Under Various RFS Implementation Scenarios."[5]

If the production of corn ethanol plateaus at (or below) 15 billion gallons per year as envisioned by Congress, the global agricultural market will no longer have to bring new land into production in order to accommodate the RFS-driven increase in demand for farm goods, and—as a result—the lifecycle GHG emissions associated with each gallon of ethanol will decrease over time. It is critically important, therefore, to prevent any subsequent expansions of corn ethanol production that would set off a new round of land use-related emission increases.

Avoiding Additional GHG Increases Going Forward

As long as cellulosic biofuel production falls short of the annual targets set by Congress, EPA must make annual adjustments to the RFS cellulosic volume mandate.[6] Congress gave EPA the authority to make corresponding reductions to the overarching annual volume requirements for "advanced biofuels" and conventional "renewable fuel."[7] The Agency declined to make corresponding reductions for compliance years 2011-2013, opting instead to allow extra production of "advanced biofuels" like sugarcane ethanol and biodiesel to make up for the shortfall in cellulosic fuels.

That approach has proven to be unsustainable. The "cellulosic void"—*i.e.*, the difference between the annual cellulosic volume targets specified at Section 211(o)(2)(B)(III) of the Clean Air Act and the volumes of cellulosic biofuel that are projected to become available over time—will be large and persistent. EPA expects that only 8-30 million gallons of cellulosic biofuel will be produced in 2014 (as compared to the EISA target of 1.75 billion gallons). Over the longer term, the US Energy Information Administration projects that less

than three billion gallons of cellulosic biofuel will be produced on an annual basis by 2022, and that production levels will not reach the 16 billion gallon target set by Congress until at least 2033. Accordingly, the cellulosic void will be too large and last too long to be sustainably backfilled with non-cellulosic advanced biofuels.

If EPA had continued to pursue this strategy of backfilling the cellulosic void with "advanced biofuels," a likely indirect—but predictable—consequence would be increases in the production of corn ethanol and palm oil. If, for example, the Agency allowed sugarcane ethanol to make up for missing volumes of cellulosic biofuel, the United States would have had to significantly increase its imports of the fuel from Brazil—which in turn would cause Brazil to significantly increase its imports of US corn ethanol in order to satisfy its own biofuel consumption mandate. According to a joint report by the Organization for Economic Cooperation and Development and the United Nations Food and Agriculture Organization, the projected increase in US demand for Brazilian sugarcane ethanol would "create a large policy driven two-way trade in ethanol" causing sugarcane ethanol exports from Brazil to the United States to triple and triggering a 17% increase in world ethanol price by 2021.[8]

Alternatively, if the shortfall was filled by soy biodiesel instead of sugarcane ethanol (an option that becomes increasingly feasible if Congress extends the biodiesel tax credit), the possibility of increased lifecycle GHG emissions remains high. Increased demand for soy biodiesel would indirectly increase the overall demand for vegetable oil, which in turn would enlarge the market for palm oil. As the Union of Concerned Scientists explained in April 2013 comments to EPA,

> Palm oil is the cheapest, fastest growing source of vegetable oil in the world, and occupies an even larger share of the global vegetable oil trade. This makes it highly likely that whether or not palm oil is directly imported into the U.S., palm oil will ultimately replace the oils and fats used to make biodiesel ... Since palm oil will ultimately be the source of oil that indirectly replaces the oils and fats required to fill an expanded biodiesel mandate, it is likely that expanding the advanced mandate will not only fail to achieve the 50% GHG emissions reduction requirement of advanced biofuels, but may also fail to reduce emissions at all. Palm oil is associated with a host of disquieting problems, mostly about draining peat swamps and cutting down forests to expand plantations, at great cost to orangutans, local people, and the global climate.[9]

Because the lifecycle GHG emissions from palm biodiesel are almost certainly higher than those from corn ethanol or gasoline, palm biodiesel "should not be allowed to indirectly fill an expanded advanced biofuel mandate."[10]

Fortunately, EPA backed away from this path in its recently proposed volume standards for 2014. Instead of backfilling the cellulosic void with sugarcane ethanol and soy biodiesel, as it had done in previous years, the Agency proposed to reduce the 2014 volume

requirements for cellulosic biofuel, advanced biofuel, and total renewable fuel below the targets set forth in EISA.

According to EPA, its new approach is necessitated by two constraints: first, the "[l]imitations in the volume of ethanol that can be consumed in gasoline given practical constraints on the supply of higher ethanol blends to the vehicles that can use them and other limits on ethanol blends in gasoline—a set of factors commonly referred to as the ethanol 'blend wall;'" and second, the "[l]imitations in the ability of the industry to produce sufficient volumes of qualifying renewable fuel" [*i.e.*, cellulosic biofuels].[11] EPA could have—and should have—justified its action by pointing out that a reduction to the implied corn ethanol mandate will also improve the RFS's environmental impact, particularly with respect to climate change.

Now that it is clear that achieving the RFS volume targets according to the schedule set forth in EISA is both technologically infeasible and environmentally damaging, Congress should support EPA's effort to recalibrate those targets. However, EPA's recent proposal represents a short-term fix to a long-term problem. We respectfully urge Congress—and especially the Committee on Environment and Public Works and the Subcommittee on Clean Air and Nuclear Safety—to work with the Agency and others to identify and implement more lasting changes to the RFS that promote reductions in net GHG emissions by phasing out incentives to produce corn ethanol and other conventional biofuels.

Conclusion

Contrary to the intentions of its drafters, the RFS is increasing, rather than reducing, net GHG emissions from the transportation sector. The Clean Air Task Force appreciates the opportunity to describe this unfortunate outcome, as well as the steps that EPA and Congress can take to reduce future emissions increases.

Respectfully submitted,

Jonathan F. Lewis
Senior Counsel
Clean Air Task Force

ENDNOTES

[1] CATF's response to the House Energy and Commerce Committee's white paper on environmental impacts of the RFS can be found at: http://www.catf.us/resources/filings/biofuels/20130524-CATF%20Response%20to%20House%20EC%20GHG%20and%20Environment%20Questions.pdf

[2] CATF's response to the House Energy and Commerce Committee's white paper on RFS and the blend wall can be found at: http://www.catf.us/resources/filings/biofuels/20130405-CATF_Response_to_House_EC_Blend_Wall_Question.pdf

[3] All text and data taken directly from an EPA chart in Docket No. EPA-HQ-OAR-2005-0161-3173.5

[4] Lester Lave, *et al.* 2011. *Renewable Fuel Standard: Potential Economic and Environmental Effects of U.S. Biofuel Policy* 221 (Report by the National Research Council Committee on Economic and Environmental Impacts of Increasing Biofuels Production) (emphais supplied; internal citations omitted) (http://www.nap.edu/openbook.php?record_id=13105).

[5] CATF, *Corn Ethanol GHG Emissions Under Various RFS Implementation Scenarios* (April 2013) (http://www.catf.us/resources/whitepapers/files/20130405-CATF%20White%20Paper-Corn%20GHG%20Emissions%20Under%20Various%20RFS%20Scenarios.pdf)

[6] CAA §211(o)(7)(D)(i) ("For any calendar year for which the projected volume of cellulosic biofuel production is less than the minimum applicable volume established under paragraph (2)(B), as determined by the Administrator based on the estimate provided under paragraph (3)(A), not later than November 30 of the preceding calendar year, the Administrator shall reduce the applicable volume of cellulosic biofuel required under paragraph (2)(B) to the projected volume available during that calendar year. For any calendar year in which the Administrator makes such a reduction, the Administrator may also reduce the applicable volume of renewable fuel and advanced biofuels requirement established under paragraph (2)(B) by the same or a lesser volume.")

[7] *Id.*

[8] OECD-FAO, *Agricultural Outlook 2012-2021* (2012) at 98-99.

[9] UCS, Comments on U.S. Environmental Protection Agency's "Regulation of Fuels and Fuel Additives: 2013 Renewable Fuel Standards" 78 Fed. Reg. 9282 (February 21, 2013) [EPA-HQ-OAR-2012-0546] (filed April 5, 2013) at 18-19 ("UCS 2013 RFS Volume Comments") (http://www.ucsusa.org/assets/documents/clean_vehicles/UCS-Comments-on-RFS-2013-Volumes.pdf). *See also id.* ("The International Food Policy Research Institute (IFPRI) recently did an analysis of oil substitution in biodiesel markets and found that because demand for soybeans is largely driven by meal, 60% of soybean oil used to make biodiesel was replaced by other oils, especially palm oil. This led to lifecycle emissions for soy biodiesel similar to fossil diesel. As volumes of vegetable oil based biodiesel grow larger, they are increasingly likely to outstrip the demand for meal, leading to a global imbalance that will be rectified indirectly by substitution of palm oil for the missing food grade vegetable oil.")

[10] *Id.* at 19

[11] EPA, 2014 Standards for the Renewable Fuel Standard Program—Proposed Rule, 78 Fed. Reg. 71732, 71735 (November 29, 2013).

Center for Coastal Conservation

Officers
Jack Lawton, Jr
Bill Shedd
Jeff Angers
Bob Kramer
Gus Schram, III
Board Members
Barbara Boxer
Scott Deal
Phil Dyskow
Bob Kramer
Jack Lawton, Jr
Jim Martin
Phil Merblick
Pat Murray
Mark Newman
Al Perkinson
Gus Schram, III
Bill Shedd
Steve Sikes

December 10, 2013

The Honorable Barbara Boxer, Chair
The Honorable David Vitter, Ranking Member
U.S. Senate Environment and Public Works Committee
Senate Dirksen Building, Room 410
Washington, DC 20510

Dear Senator Boxer and Senator Vitter:

The Center for Coastal Conservation is a coalition of the leading advocates for marine recreational fishing and boating. It is dedicated to promoting sound conservation and use of America's ocean resources.

As the Congress considers reform of the Renewable Fuels Standard (RFS), we encourage you to consider the impacts of higher volumes of corn-based ethanol on marine resources and particularly recreational fisheries. We are also concerned that the growth of the mandate will force the use of ethanol blends above 10% (E-10) that could be very harmful to marine engines.

As corn production increases on marginal lands, so does the use of fertilizers leading to increased nutrient runoff that degrades water quality and contributes to hypoxia as far away as the Gulf of Mexico. Estimates suggest that where irrigation is required it can take hundreds gallons of water to produce just one gallon of corn-based ethanol. These water quantity and water quality impacts threaten fish habitat across the country and also threaten a sportfishing industry that contributes $61.7 billion to our economy, not to mention further negative impacts to commercial fisheries and our seafood industry.

The increasing size of the mandate coupled with declining gasoline demand is also leading imminently to the "blend-wall," which will force blends above E-10 into the market. We are very concerned about the potential effects on marine engines and early testing of E-15 has shown damaging results. Forcing these blends into the market could have significant economic impacts associated with engine damage and present serious safety concerns.

While we are optimistic about the development of advanced biofuels, we would urge you to consider measures to preclude feedstocks like invasive

aquatic species and ensure against negative impacts to water quality and excessive water use from future fuels. EPA actions to lower the 2014 Renewable Volume Obligation are an important step, but that is only a temporary fix of the Renewable Fuel Standard. Congress must take action to amend the RFS and address these challenging issues.

As you address this critical need for reform, we strongly urge you to seek a long-term solution that addresses these impacts to marine resources and recreational fishermen.

Sincerely,

Jefferson Angers
President

American Bakers Association

Serving the Baking Industry Since 1897

December 11, 2013

The Honorable Barbara Boxer
Chairman
Senate Environment & Public Works Committee
United States Senate
410 Dirksen Senate Office Building
Washington, DC 20510

The Honorable David Vitter
Ranking Member
Senate Environment & Public Works Committee
United States Senate
456 Dirksen Senate Office Building
Washington, DC 20510

Dear Chairman Boxer and Ranking Member Vitter:

The American Bakers Association (ABA) thanks the Senate Environment and Public Works Committee for conducting an oversight hearing of the Environmental Protection Agency's (EPA) Renewable Fuel Standard (RFS). ABA supports meaningful Congressional action to address the many issues with the RFS program and we offer the below comments. ABA is the Washington D.C. based voice of the wholesale baking industry. Since 1897, ABA has represented the interests of bakers before the U.S. Congress, federal agencies, and international regulatory authorities. ABA advocates on behalf of more than 700 baking facilities and their suppliers. ABA members produce bread, rolls, crackers, bagels, sweet goods, tortillas and many other wholesome, nutritious, baked products for America's families. The baking industry generates more than $102 billion in economic activity annually and employs more than 633,000 highly skilled people. ABA is providing our perspective on the EPA's RFS.

- ABA recognizes and supports EPA's modest proposal to lower the corn-based ethanol mandate in the 2014 Standards for the Renewable Fuel Standard Program (RFS)[1]. However, we strongly encourage EPA to move to further alleviate the volatility that corn-based ethanol creates in the grain markets. We believe this cannot be done without Congressional action.

- Corn-based ethanol is a factor that has led to decreased wheat acreage in the US. While we do not fault the farmer for planting what will bring the most profit, wheat acreage has declined by almost 25 million acres over the past 30 years, in large part, we believe, due to the RFS. In fact, in Kansas the wheat basket of the country, more corn is grown than wheat.

- The wheat market typically follows the corn market, so when the RFS drives corn prices higher, wheat prices also rise. Some studies show that the RFS drove corn prices up by 35 percent during the 2011/12 crop year.[2] During this same time, wheat prices rose by 22 percent. These spikes impact market volatility and create market uncertainty for the baking industry.

- The above factors continue leading to tighter budgets and hinder job creation at a time when businesses, including bakers, are challenged by the ongoing economic environment. Ultimately, it is the American family that pays the price.

Respectfully Submitted,

Robb MacKie
President & CEO

---

[1] *78 Fed. Reg. 71732, November 29, 2013*
[2] *"Feed Grains, Ethanol and Energy – Emerging Price Relationships," Dr. Tom Elam, President, FarmEcon LLC, Dr. Steve Meyer, President, Paragon Economics, 12/27/2010*

BakersEnrichAmerica

Economic Impact of **BAKING** in **Maryland**

Direct Jobs:
10,950
Wages:
$503,981,900
Economic Impact:
$1,343,685,100
Tax Revenues
$265,905,700

- **A further 15,050 jobs** were indirectly supported by the baking industry through suppliers and the indirect impact of the industry's expenditures.
- The total economic impact of baked goods produced and sold specifically in Maryland is **$3,570,572,400**. Bakers contribute nearly 1.19% of Maryland's total economic activity.
- In 2013, the total economic impact of the baking industry in America was about **1.97%** of the nation's GDP.

ABA Members in Your State:

American Yeast Corporation (Baltimore Plant and Warehouse) • Automatic Rolls of Baltimore • Bakers Express of Maryland (H&S) • Bakery de France (2) • Bimbo Bakeries USA • Crispy Bagel Company • H&S Bakery • Krispy Kreme - Retail (2) • McCormick & Company, Inc. • Mid Atlantic Baking Company • Ottenberg Baking Company • Schmidt Baking Company • Vie de France Yamazaki - RETAIL (3)

Advanced
Biofuels
Association

December 11, 2013

The Honorable Barbara Boxer
Committee on Environment and Public Works
United States Senate
Washington, D.C. 20510

The Honorable David Vitter
Committee on Environment and Public Works
United States Senate
Washington, D.C. 20510

Dear Chairwoman Boxer and Ranking Member Vitter:

On behalf of the Advanced Biofuels Association, thank you for the opportunity to present our comments on the current state of domestic renewable fuel production and policy. We appreciate the Committee's consideration of this topic. The Advanced Biofuels Association ("ABFA") represents nearly 50 companies that produce advanced and cellulosic biofuels, as well as renewable feedstocks, and is the leading industry organization for second and third generation renewable fuels.

Advanced and cellulosic biofuels are the sector of the renewable fuels industry that meet the highest greenhouse gas performance targets and are treated by the Renewable Fuel Standard as separate from other renewable fuels. For example, advanced biofuels, biomass-based diesel, and cellulosic biofuels have specific targets, known as Renewable Volume Obligations (RVOs), that must be met under the umbrella target for all renewable fuels. These fuels typically are 'drop-in' and easily integrate into the existing infrastructure.

2013 has been a year of continued growth and strength for the advanced industry. More facilities are coming online and making an impact at greater market scales. These early successes are driving capital investments, inspiring technology innovation, and are bringing better fuels to market. However, confusion and uncertainty caused by the regulatory, legislative, and potential judicial debates over the RFS threaten to halt and even reverse the positive gains made over the last few years.

The proposal by EPA on November 28, 2013 for next year's RVOs set advanced biofuels at 2.2 billion gallons, with a range from 2.0 billion gallons to 2.51 billion gallons. A 2.2 billion gallon target represents a 20-percent cut from the 2013 level and a disheartening 1.55-billion-gallon reduction from the volume contemplated by statute.

In the ongoing fight between the oil industry and the corn ethanol industry, advanced biofuels companies have become collateral damage. The reductions in the advanced pool have

2099 Pennsylvania Avenue, NW • Suite 100 • Washington, DC 20006
T: 202.469.5140 • F: 202.955.5564 • W: advancedbiofuelsassociation.com

already begun to freeze capital, and investors are growing concerned by the possibility that law suits will place the RFS in suspended animation.

This proposal will pull the rug out from underneath the growing advanced biofuels sector and will severely harm this industry. It is a significant departure from the RVO proposals of the past. It is also a departure from a clear Congressional intent to steadily increase the target for advanced biofuels year over year. EPA's proposal to put the target below current production by torturing a model and flipping arguments previously made on EPA's waiver authority, is a major violation of the statute and the commitment of Congress and the Administration to creating an advanced biofuels industry. While there are many issues of concern, we would like to bring three to the attention of the Committee.

Number One: EPA's proposed RFS reductions fall disproportionately on advanced biofuels. EPA is proposing to cut volume requirements for advanced biofuels by more than 40 percent when compared to the requirements written into the RFS statute. In contrast, EPA is proposing a less than 10 percent reduction to volume requirements for conventional biofuels. It is counterproductive to the Administration's stated goal of reducing climate change to deliver such a large blow to the category of renewable fuels that reduces greenhouse gas emissions the most.

Number Two: EPA's Monte Carlo model is not appropriate for the advanced and cellulosic biofuels industry. EPA's proposed methodology for setting upcoming RFS targets looks *backwards at the average of historical data*, rather than *forward to future production levels*. For our evolving industry, such a policy will ensure a continuous oversupply of advanced biofuels compared to what the EPA model forecasts. This imbalance will in turn crater the value of the renewable identification numbers (or RINs) that are instrumental to financing the development of future advanced and cellulosic biofuel facilities. The agency cannot support the emergence of a low-carbon, innovative industry by looking through the rear-view mirror.

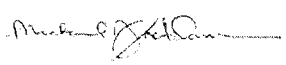
Number Three: EPA should set RFS standards that encourage production and consumption of all available advanced biofuels. For an Administration that is committed to addressing climate change, this proposal leaves low-hanging fruit still in the tree by setting consumption targets below available levels of advanced biofuels, plus carry-over RINs. ABFA takes issue with EPA's Monte Carlo model. But even using the agency's lowball estimate, EPA predicts up to 3.23 billion gallons of advanced biofuel will be available next year. This estimate is in line with ABFA's conservative forecast that our industry will generate at least 3.2 billion RINs in 2013 that qualify as advanced biofuels, exceeding this year's target by at least 500 million RINs and generating that many carry-over RINs. To continue to support new production, EPA should set a 2014 advanced biofuel target that can be met and exceeded by current production plus carry-over RINs.

Whether intended or not, this rule has sent a chilling signal to financial markets everywhere about the continued desire of this Administration to support and grow an advanced and cellulosic biofuels industry in the United States. Like the private sector, Congress has invested billions of federal dollars to develop the advanced biofuels industry to meet a host of critical national policy and security objectives. It is counter intuitive that the EPA would

undercut the very companies that Congress and the Administration has funded, and continues to fund, to develop these fuels. The RFS is supposed to set a policy framework to meet our energy needs and deal responsibly with environmental issues, including greenhouse gas emissions. EPA, by backsliding away from the Congressional intent, is allowing higher greenhouse gas emitting fuels to replace these gallons which will in turn increase overall greenhouse gas emissions in the United States.

We are grateful for this opportunity to have provided you our comments and hope the Committee will actively review the proposed rule. We strongly encourage the Committee to intervene with EPA, and at minimum push for the alternative "Option 1" that results in an increased target for advanced biofuels. Thank you and we look forward to working with you to help grow an advanced biofuels industry.

Sincerely,



Michael McAdams
President
Advanced Biofuels Association

December 11, 2013

Sen. Barbara Boxer (D-CA)
Chairwoman
Senate Committee on Environment
and Public Works
410 Dirksen Senate Office Bldg.
Washington, DC 20510-6175

David Vitter (R-LA)
Ranking Member
Senate Committee on Environment
and Public Works
456 Dirksen Senate Office Bldg.
Washington, DC 20510-6175

Dear Chairwoman Boxer and Ranking Member Vitter:

The Snack Food Association (SFA) is the international trade association of the snack food industry representing snack manufacturers and suppliers. Founded in 1937, SFA represents over 400 national companies and family-operated businesses that all provide critical economic support to their local communities. SFA members produce a wide variety of foods ranging from pretzels and popcorn to fruit snacks and granola.

SFA commends the Senate Environment and Public Works Committee for holding a hearing to conduct oversight of the Renewable Fuel Standard (RFS). The RFS is a concern to the snack food industry because it artificially increases the price of corn and soy oil, which are both used as ingredients by SFA company members. Corn is a core ingredient to the American food supply and increases in its cost drives up the prices of almost every food in the supply chain. The RFS hurts SFA members large and small, and left unchanged, SFA believes these mandates would have a profound negative impact on the snack food industry and the consumers that purchase snack products.

For this reason, we applaud EPA's proposal to scale back the scheduled increases in the various biofuels mandates as an important step in the right direction. The proposed changes are a much-needed step to ensure that no additional harm is done by the RFS to the snack food industry and its customers in 2014. We encourage EPA to finalize the rule with these proposed changes. If left unchanged from the original levels, these mandates for the total RFS, the advanced biofuels mandate and the biodiesel mandate would create further upward pressure on the ingredients used in snack food production.

While there are many factors behind the increase in food prices, the renewable fuels mandate is the only one that the government has the ability to control. This outdated policy impacts countless food manufacturers and all American consumers. EPA's recent proposal is a much-needed step in the right direction. However, we also support Congressional action to fully address the problems that the RFS raises. It has been more than five years since the RFS was last revised. On behalf of our membership, SFA respectfully urges Congressional action to reform or repeal the RFS by enacting meaningful and permanent changes that fully take into account the impact that this policy has on all sectors of the economy, including the food industry.

We thank you for your time and consideration.

Sincerely,

Tom Dempsey
Snack Food Association
CEO

NRF's Chain Restaurant Division
nccr
National Council of Chain Restaurants

December 10, 2013

The Honorable David Vitter
Ranking Member, Committee on Environment and Public Works
U.S. Senate
Washington, DC 20510-6175

Dear Senator Vitter:

Please see attached our written statement for the record and supporting documents regarding tomorrow's Oversight Hearing on Domestic Renewable Fuels before the Senate Committee on Environment and Public Works.

We appreciate this opportunity to provide input as you and the Committee conduct a review of the Renewable Fuel Standard.

Sincerely,

Robert J. Green
Executive Director

National Council of Chain Restaurants
325 7th St NW • Suite 1100 • Washington, DC 20004
202.626.8183 • 202.626.8185 fax • www.nccr.net

STATEMENT FOR THE RECORD FROM
NATIONAL COUNCIL OF CHAIN RESTAURANTS TO
SENATE COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS
OVERSIGHT HEARING ON DOMESTIC RENEWABLE FUELS
DECEMBER 11, 2013

On behalf of the National Council of Chain Restaurants (NCCR), the following comments are submitted for the record for the December 11, 2013 Oversight Hearing on Domestic Renewable Fuels. The National Council of Chain Restaurants, a division of the National Retail Federation, is the leading organization exclusively representing chain restaurant companies. For more than 40 years, NCCR has worked to advance sound public policy that serves restaurant businesses and the millions of people they employ. NCCR members include the country's most respected quick-service and table-service chain restaurants.

Chain restaurants are largely owned and operated by tens of thousands of small business franchisees, most of whom have one, two, or a small handful of individual restaurant locations. These small business franchisees are often family-run enterprises, and they are the very picture of small business in America. They give back to their communities through charitable donations to local good causes, and they serve as popular gathering places for family events, special occasions, and they serve countless meals to everyday Americans every single day.

In recent years, food commodity costs for chain restaurants and their small business franchisees have increased dramatically. This increase has happened to coincide with the enactment and implementation of the Renewable Fuel Standard. These higher food commodity prices are not unique to chain restaurants, but have been experienced by nearly every entity along the food chain, from poultry and livestock farmers on one end of the chain to chain restaurants and other retail food outlets on the other.

NCCR recently gathered together the members of the food supply chain that, along with small business chain restaurants, have suffered under the RFS mandate. We launched a public awareness campaign to inform policymakers about the numerous ways in which the RFS imposes costs to food chain small businesses. Our initiative, "Feed Food Fairness: Take RFS off the Menu," has a website (www.RFSOfftheMenu.org) which includes a variety of information about how the RFS raises food commodity prices for small business and consumers alike.

Relevant research and studies by entities including the Congressional Budget Office, USDA Economic Research Service, Congressional Research Service, World Bank and National Research Council have all implicated the RFS in the sustained climb in food commodity prices.

Moreover, numerous academic studies have done the same. The attached Feed Food Fairness document, "The RFS and Rising Food Costs" details this research.

Although the public domain is replete with evidence that the RFS is, in fact, a significant factor contributing to higher food commodity prices, NCCR endeavored to determine the extent to which this is the case specifically for chain restaurants. NCCR commissioned the independent firm of PricewaterhouseCoopers (PwC) to thoroughly examine this issue. PwC reviewed existing private sector, academic, and government studies on the impacts of the RFS mandate on ethanol production and the price of corn and other commodities. They then combined these estimates with survey information on commodity purchases by chain restaurants to estimate the overall impact of the RFS on chain restaurant input costs.

PwC issued its findings in a report released in November 2012 entitled "Federal Ethanol Policies and Chain Restaurant Food Costs." The full report is available on our website at www.nccr.net.

PwC concluded that the conventional portion of the RFS mandate, when fully implemented in 2015, will raise chain restaurant food costs by up to $3.2 billion dollars a year, every year. That estimate is prospective from 2015 onward – it does not include all the years that the RFS has been in effect since its enactment. A summary of the PwC report's findings is included in the attached Feed Food Fairness document "PwC Study: Key Findings."

In addition to its estimate of the RFS' costs to chain restaurants industry-wide, PwC also estimated the impact on a unit franchise basis. For a typical quick service chain restaurant franchise unit (one restaurant), the RFS is estimated to raise food costs by about 10% per year, or $18,000. For a typical casual dining restaurant, the PwC estimate is 9%, or about $17,000.

For the economy as a whole, PwC's findings are remarkable and concerning. If the RFS policy remains in effect unchanged, PwC estimated that by 2015 the mandate will result in the following percentage price increases for several key commodities: corn, 26.8%; soybeans, 15.7%; pork, 15%; potatoes, 13%; wheat, 12.1%; eggs, 11.2%; poultry, 7.7%; beef, 7.5%. The attached infographic displays the results in vivid terms. In addition, PwC estimates that the RFS will result in the production of an additional 6 billion gallons of ethanol which otherwise would not be produced in the absence of the mandate.

To provide an example and bring these numbers into perspective, consider the experience of one individual chain restaurant franchisee. Ed and Judy Anderson own and operate, with their son, four Wendy's restaurants in Virginia. Mr. Anderson testified before the House Energy & Commerce Subcommittee on Energy & Power in July that he estimates the RFS to cost his restaurants up to $30,000 per year, per location. For his four Wendy's restaurants, that's $120,000 a year in higher food costs, which is money that the Andersons are not able to use to expand their business. Unfortunately, the Anderson's experience with the RFS is all-too-common.

Last week NCCR testified at a public hearing held by the Environmental Protection Agency (EPA) to collect stakeholder comment on the Agency's proposed 2014 Renewable Volume Obligations under the RFS. We expressed our support for the Agency's proposal to slightly reduce the conventional (corn) ethanol mandate for 2014 but urged the Agency to pursue further reductions in its final rule. Although a positive first step, the proposal barely dents the conventional ethanol requirement and will likely not shrink the 40+% of U.S. corn production that is currently commanded by ethanol. To provide real relief to American small business, farmers and consumers, it is Congress that will need to act to fix the problem.

Following today's hearing, we urge the members of the Committee to consider legislation to, at the very least, repeal the corn ethanol mandate of the RFS. Bipartisan legislation sponsored by Senators Barrasso, Pryor, Inhofe, Crapo, Boozman and others would achieve this result, as would legislation that is forthcoming from Senators Feinstein and Coburn. We support these efforts.

We thank you for the opportunity to submit these comments for the hearing record and we look forward to working with you to alleviate the burdens imposed by the current harmful RFS policy.

Thank you.

###

The RFS and Rising Food Costs

Proponents of the Renewable Fuel Standard (RFS) claim that it has no impact on food prices. Small business owners from America's chain restaurants know from experience that food costs have significantly increased throughout the history of the RFS. Research from the United States Department of Agriculture, Congressional Budget Office and World Bank clearly show the RFS is causing food costs to rise.

Here are the facts:

- According to the **Congressional Budget Office,** producing ethanol for use in motor fuels increases the demand for corn, which ultimately raises the prices that consumers pay for a wide variety of foods at the grocery store, ranging from corn syrup sweeteners found in soft drinks to meat, dairy, and poultry products.[i]
- Livestock, dairy and poultry are impacted by the RFS as they compete for feedstock with the government supported biofuel industry. Prices of all proteins have risen drastically since the implementation of the RFS. For example, the impact of biofuels on the retail price of broiler meat during 2007-2009 is likely to have been in the range of 5.8 to 11.6 percent.[ii]
- An increase in the price of corn 20 to 40 percent results in a 2 to 4 percent increase in prices of corn-based food products at the retail level.[iii]
- The **United States Department of Agriculture's Economic Research Service** stated that the increase in the price of corn first affects the price of beef, pork, poultry and dairy, while "the full effects of the increase in corn prices for packaged and processed foods will likely take 10-12 months to move through to retail prices."[iv]
- Since the RFS was most fully implemented in 2008, food price inflation has gone from slightly lower than general inflation to 60 percent higher than general inflation.[v]
- Since 2005, the consumer price index for food rose nearly 25 percent compared with a 16 percent increase in core inflation during that same time.[vi]
- The producer price index, a gauge of the costs incurred by producers to produce food products, increased from 2005 – 2012 by 31%, indicating that not only are consumers paying more for food, but those who provide food have had to unfairly absorb some of those costs to the detriment of their business during difficult economic times.[vii]
- According to the **Congressional Research Service**, the RFS will raise annual food costs by $3 billion by 2022.[viii]
- A study by the **World Bank** states, "without these policies [the RFS mandate], biofuels production would have been lower and food commodity prices would have been smaller."[ix]

The independent research and facts show that the RFS has an unmistakable impact causing food prices to increase. It is time to repeal this failed government mandate and take the RFS off the menu.

---

[i] Congressional Budget Office, *The Impact of Ethanol Use on Food Prices and Greenhouse-Gas Emissions*, April 2009, p.6
[ii] Committee on Economic and Environmental Impacts of Increasing Biofuels Production, National Research Council, Renewable Fuel Standard, 2011, p. 133
[iii] Committee on Economic and Environmental Impacts of Increasing Biofuels Production, National Research Council, *Renewable Fuel Standard*, 2011, p. 133
[iv] USDA, Economic Research Service, *U.S. Drought 2012*: Farm and Food Impacts
[v] Thomas Elam, *The RFS, Fuel and Food Prices, and the Need for Reform*, April 18, 2013, p. 8
[vi] Bureau of Labor Statistics, CPI, U.S. City Average, Food, January 2005 to December 2012
[vii] Bureau of Labor Statistics, PPI, Stage Processing, Finished Consumer Foods (WPSSOP3110), Jan 2005 – Dec 2012
[viii] Congressional Research Service, *Renewable Fuel Standards (RFS): Overview and Issues*, March 13, 2013, p. 17
[ix] Donald Mitchell, *A Note on Rising Food Prices*, July 2008, p. 17

Federal Ethanol Policies and Chain Restaurant Food Costs

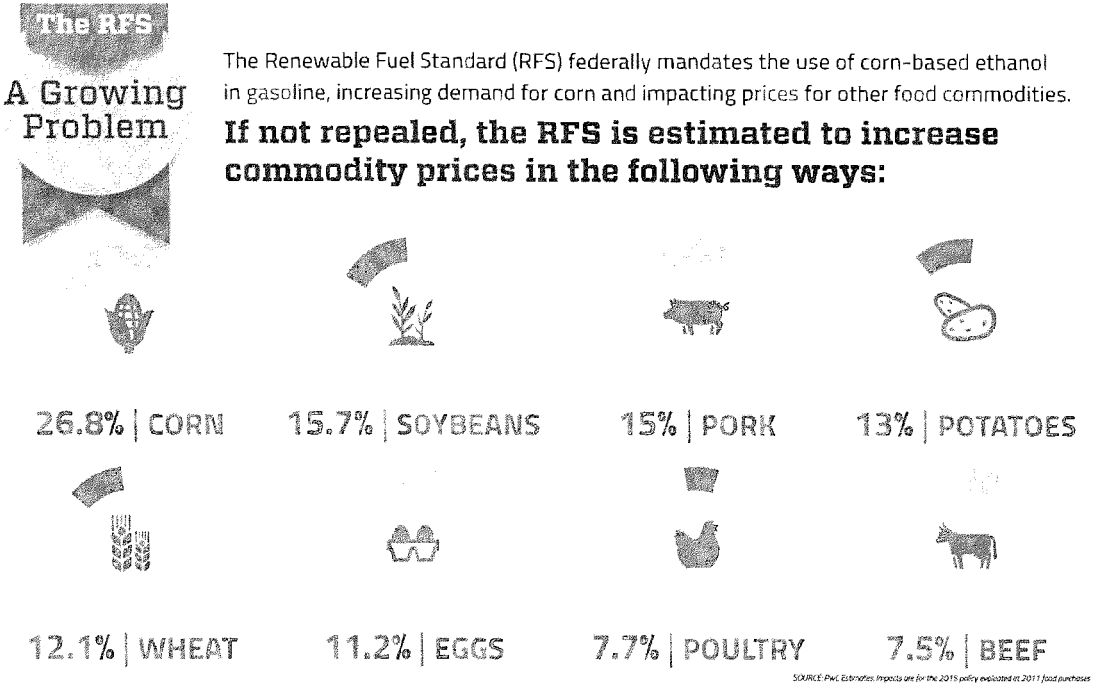
PwC Study: Key Findings

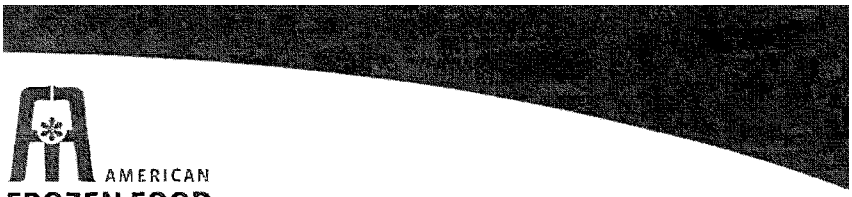
In November 2012, PricewaterhouseCoopers (PwC), one of the world's leading audit, assurance, tax and consulting practices, issued a study that measured the impact of the federal Renewable Fuel Standard (RFS) on the chain restaurant industry and its small business franchisees.

The following are some of the key findings that show how the RFS negatively impacts chain restaurants around the country.

- The RFS mandate, which requires an ever-increasing volume of ethanol fuel from corn to be blended into gasoline each year, significantly increases the food input costs of chain restaurant operators.
- As purchasers of a wide range of agricultural commodities, chain restaurants **face higher input costs for their food purchases due to the RFS mandate.**
- Corn is an input into the production of a wide variety of food products, from baked goods to meat production. **By increasing the demand for ethanol, the RFS increases the price of other agricultural and food commodities.** For example, corn is an important input to livestock producers so an increase in the price of corn will directly affect livestock prices.
- The increased price of corn causes farmers to shift production away from other crops to corn. These shifts help ease the increase in corn prices, but also increase the price of other crops.
- Producers are unable to avoid greater input costs since the RFS causes the price of alternatives to corn, such as soybean meal and other grains, to also increase.
- The RFS mandate is estimated to increase ethanol production by six billion gallons by 2015 – resulting in an **estimated 27 percent increase in corn prices.**
- The 2015 **the RFS mandate will increase total costs for chain restaurants by $3.2 billion** – at quick-service restaurants, **total costs increase by $2.5 billion or ten percent** and at full service restaurants **costs increase by $691 million or nearly nine percent.**
- As a result of the RFS mandate, individual quick-service restaurants experience an **additional $18,190 in cost per restaurant** and full service restaurants realize **an additional $17,195 in cost per restaurant.**
- Chain restaurants would generally experience similar **increases each year the RFS is in place.** In periods of market disruption, such as a drought, the impact is likely to be even greater.
- The 2012 drought demonstrates that in periods of supply shocks, the RFS mandate increases price volatility.

The study clearly shows that the RFS has a significant impact causing food prices to increase for small business chain restaurants and American consumers. *It is time to repeal this failed government mandate and take the RFS off the menu.*


The RFS
A Growing Problem
The Renewable Fuel Standard (RFS) federally mandates the use of corn-based ethanol in gasoline, increasing demand for corn and impacting prices for other food commodities.
If not repealed, the RFS is estimated to increase commodity prices in the following ways:
26.8% | CORN
15.7% | SOYBEANS
15% | PORK
13% | POTATOES
12.1% | WHEAT
11.2% | EGGS
7.7% | POULTRY
7.5% | BEEF
SOURCE: PwC Estimates. Impacts are for the 2015 policy evaluated at 2011 food purchases
American consumers and diners can't afford to let the RFS drive up the price of every day foods.
Join Feed Food Fairness in support of the Renewable Fuel Standard Elimination Act (H.R. 1461) and the Renewable Fuel Standard Repeal Act (S. 1195). It's time to take the RFS off the menu.
"Feed Food Fairness: Take RFS Off the Menu" is a food chain grassroots campaign focused on repealing the Renewable Fuel Standard (RFS) and the corn ethanol mandate. Coalition members have joined with Congressional allies to expose the harmful and costly economic effects of the RFS on small business chain restaurant owners and operators, American consumers and diners. To learn more visit www.RFSOfftheMenu.org



AMERICAN
FROZEN FOOD
INSTITUTE

December 10, 2013

The Honorable Barbara Boxer
Chairman
Senate Environment and Public Works Committee
410 Dirksen Senate Office Building
Washington, DC 20510

The Honorable David Vitter
Ranking Member
Senate Environment and Public Works Committee
456 Dirksen Senate Office Building
Washington, DC 20510

Dear Chairman Boxer and Ranking Member Vitter:

On behalf of the American Frozen Food Institute (AFFI), I am writing to express support for your efforts to examine the Renewable Fuel Standard (RFS). We believe the RFS is unnecessary, unworkable and must ultimately be eliminated.

AFFI is the sole national trade association that promotes the interests of all segments of the frozen food industry. Our more than 500 member companies are responsible for approximately 90 percent of the frozen food processed annually in the United States. AFFI's members are located throughout the country and are engaged in the manufacture, processing, transportation, distribution, marketing and sale of products nationally and internationally.

Most of the ethanol mandate relies on corn and the biofuel produced today relies or soybeans, another vital food stock. We believe food-based commodities should be used to fuel bodies, not vehicle engines, particularly given the tremendous impact this can have on the costs and prices food makers and grocery shoppers must bear.

Corn impacts almost 75 percent of the goods found on supermarket shelves. Corn and soybeans are key animal feed ingredients, with feed accounting for 69 percent of livestock production costs. As a result, price volatility for corn and soybeans has a tremendously negative impact on the cost of food.

Frozen food companies are vulnerable to rising corn and soybean prices because we are a major "consumer" of all these products - both single and multi-ingredient frozen foods depend on the price and availability of meat proteins, dairy, wheat, sweeteners, soybeans, corn and specialty crops. These ingredients are critical in preparing a diverse range of popular, affordable, nutritious, family-focused frozen prepared-meals.

When the RFS causes corn prices to rise the price of other major crops rise as well. This includes horticultural crops important to frozen food makers such as potatoes, strawberries and vegetables for processing, including sweet corn and beans.

2000 Corporate Ridge | Suite 1000 | McLean, Virginia 22102 | 703.821.0770 (p) | 703.821.1350 (f) | info@affi.com | www.affi.com

The shrinking supply of corn grown for food consumption has caused food prices to spike nearly 18 percent, raising food costs for a family of four between $1,344 and $2,658 per year, according to a study conducted by the National Council of Chain Restaurants.

Rising food prices are a significant challenge for the poorest 20 percent of Americans who spend about one-third of their after-tax income on food.

In 2012, despite the worst drought in 50 years, the United States diverted 40 percent of its corn crop into fuel to satisfy the RFS—risking the rise of corn prices and food costs across the country. AFFI petitioned EPA to waive the mandate to save consumers from predicted food price spikes. Unfortunately, the agency failed to act and this failure demonstrates the vital need for this committee's examination of the operation and oversight of the program.

Should EPA fail to enact its proposed 2014 volume requirements, the ethanol and cellulosic biofuel mandates will be set at aspirational levels completely divorced from reality, a most unwelcome development for food makers and consumers.

As the committee examines the RFS, we urge you to thoroughly investigate the pressure the program is putting on the food industry because of the vast utilization of corn through the ethanol mandate.

We urge you also to look at the impact the biodiesel mandate is having on soybean prices. If the current biodiesel mandates are not adjusted, soy oil use for biodiesel will likely explode by 2016, rising from 5 billion pounds in 2013 to over 29.3 billion pounds in 2016. This could equate to 150 percent of all current U.S. soybean production with demand exceeding production.

If the RFS mandates are not significantly rolled back or repealed, we are expected to experience annual price increases in beef and chicken over 7 percent; in eggs over 11; and potatoes 13 percent, according to a National Economic Research Associates October 2012 study.

Consumers should be shielded from the costs of an overly aggressive and unrealistic ethanol and biofuels mandate. AFFI applauds the committee for examining this vital issue and urges the committee to act on legislation that would provide the relief that food makers and consumers desperately need.

We stand ready to continue to work with you on this important issue.

Sincerely yours,

Kristin Pearson Wilcox
Vice President of Government Affairs
American Frozen Food Institute

FOUNDED IN 1887 BY THEODORE ROOSEVELT

BOONE AND CROCKETT CLUB

ROBERT MODEL
CHAIRMAN

December 10, 2013

The Honorable Barbara Boxer, Chair
The Honorable David Vitter, Ranking Member
United States Senate
Environment and Public Works Committee
Senate Dirksen Building, Room 410
Washington, DC 20510

Dear Senator Boxer and Senator Vitter:

The Boone and Crockett Club was founded in 1887 by Theodore Roosevelt and George Bird Grinnell and is the oldest wildlife conservation organization in North America. The Club's mission is to promote the conservation and management of wildlife, especially big game and its habitat, to preserve and encourage hunting, and to maintain the highest ethical standards of fair chase and sportsmanship in North America.

As Congress considers reform of the Renewable Fuels Standard (RFS), Club shares its concern that the RFS mandate for corn-ethanol is driving land conversion of grassland, prairies and CRP acres. The higher RFS mandate has coincided with an estimated loss of more than 1 million acres of grasslands in just a few years, which continues at an alarming rate.

The Boone and Crockett Club is specifically concerned that the grasslands and CRP acres being converted to corn fields are highly erodible, proximate to wetlands or supported waterfowl nesting habitat. The loss of habitat already is causing reductions in wildlife populations, and that in turn is hurting the local economy that depends on hunting.

The Club is encouraged by the promise of "second generation" advanced biofuels. Further, the Club is strongly supportive of private landowners' right to use their land as they chose. The government mandate for ethanol, however, needs prompt reform by Congress.

Thank you for considering these important impacts on America's wildlife and sporting community.

Sincerely,

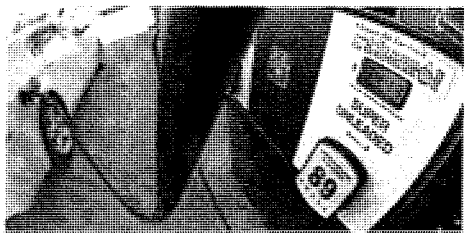
Robert Model
Chairman

AP

The Big Story

EPA proposes reducing biofuel mandate

By DINA CAPPIELLO and MARY CLARE JALONICK
— Nov. 15, 2013 4:28 PM EST
Home » AP Organization » EPA proposes reducing biofuel mandate



FILE This July 26, 2013 file photo shows a motorist filling up with gasoline containing ethanol in Des Moines. The Obama administration on Friday proposed to reduce the amount of ethanol in the nation's fuel supply for the first time, acknowledging that the biofuel law championed by both parties in 2007 is not working as well as expected.(AP Photo/Charlie Riedel, File)

WASHINGTON (AP) — The Obama administration on Friday proposed to reduce the amount of ethanol in the nation's fuel supply for the first time, acknowledging that the biofuel law championed by both parties in 2007 is not working as well as expected.

While the proposal highlights the government's struggle to ramp up production of homegrown biofuels that are cleaner-burning than gasoline, it is unlikely to mean much for consumers at the pump.

The change would reduce by almost 3 billion gallons the amounts of ethanol and other biofuels blended into gasoline in 2014 than the law requires.

The 2007 law tried to address global warming, reduce dependence on foreign oil and prop up the rural economy by requiring oil companies to blend billions of gallons of biofuels into their gasoline each year. But politicians who wrote the law didn't anticipate fuel economy to improve as much as it has in recent years, which reduced demand for gasoline.

Meanwhile, next-generation biofuels, made from agricultural waste such as wood chips and corncobs, have not taken off as quickly as Congress required and the administration expected.

President Barack Obama has championed biofuels since his days representing Illinois in the Senate, and his administration has resisted previous calls to lower biofuel volumes or repeal the law.

EPA officials said they were still committed to alternative fuels as part of a comprehensive energy strategy. If the EPA stuck to the volumes mandated by law, the amount of biofuel required would generate more ethanol than many engines can safely handle, officials said.

"We have made great progress in recent years, and EPA continues to support the RFS goal of increasing biofuel production and use," EPA Administrator Gina McCarthy, referring to the 2007 law called the Renewable Fuel Standard.

Biofuel supporters, however, said the proposal marked a departure for the Obama administration.

"This is the first time that the Obama administration has shown any sign of wavering," said Brooke Coleman, executive director of the Advanced Ethanol Council.

Bob Dinneen, the head of the Renewable Fuels Association, the Washington group that lobbies on behalf of the ethanol industry, said the announcement is ill-timed as the country is currently harvesting a record corn crop. He said the industry may sue if the proposal is not altered.

"This is exactly the wrong time to be reducing the required volumes of renewable fuels," Dinneen said.

The ethanol mandate created an unusual alliance between oil companies, which have seen ethanol cut into their share of the gasoline market, and environmental groups that oppose planting more corn for fuel. A recent AP investigation found that corn-based ethanol's effect on the environment is far worse than the government predicted or admits.

The oil industry lobbied hard for a reduction and is pleading with Congress to completely repeal the law.

Jack Gerard, president and CEO of the American Petroleum Institute, said the EPA's move is a step in the right direction, but "ultimately, Congress must protect consumers by repealing this outdated and unworkable program once and for all."

House Energy and Commerce Committee Chairman Fred Upton, R-Mich., said his panel is working on "comprehensive reforms" to the law.

"The status quo is no longer workable," Upton said.

Also in the proposal, the requirement for the amount of next-generation biofuels from nonfood plant sources, called cellulosic fuels, has been reduced for the fifth time in five years. The original law required 1.75 billion gallons of this fuel, which offers huge reductions in greenhouse gases compared with oil. For 2014, refiners would be required to blend 17 million gallons.

That's because companies have not yet been able to generate these fuels, which are far more complicated to produce than conventional biofuels, at high volumes. The target for next year does represent an increase from last year's 6 million gallons, though, and cellulosic fuels are the only category of biofuel to increase under the 2014 proposal. Two new cellulosic biofuel refineries are expected to begin producing fuel early next year.

Associated Press writer Jonathan Fahey contributed to this report from New York.

AP

Alternative Energy - BP

bp.com

See how BP's advanced technologies are expanding energy production.

The Big Story

Q&A: Ethanol, oil and what it means to be green

By DINA CAPPIELLO and MATT APUZZO
— Nov. 12, 2013 12:26 AM EST
Home » United States government » Q&A: Ethanol, oil and what it means to be green

WASHINGTON (AP) — Q: What is the ethanol mandate?

A: In 2007, Congress passed a law requiring oil companies to blend corn ethanol into the gasoline supply. That requirement started at 9 billion gallons and has risen each year since. This year, it's about 13 billion gallons. Barack Obama, who was running for president against a crowded field of Democrats in the Iowa caucuses, was a champion for this law. And with oil prices high and imports climbing, President George W. Bush signed it. Politicians in both parties predicted homegrown corn would help reduce greenhouse gas emissions that contribute to global warming and help wean the country off foreign sources of oil.

Q: Sounds straightforward. Green energy, right?

A: Not really. From the beginning, environmentalists were skeptical of this program. Even people on Obama's environmental team had doubts. Ethanol comes with all kinds of environmental baggage, like the fertilizer used to grow corn and the coal and natural gas that fuel ethanol plants. The ethanol policy also helped send corn prices rising, which encouraged farmers to plant more corn, in some cases on native prairies and land set aside for conserving habitat.

In Des Moines, Iowa, the water utility was strained to the brink this summer as it tried to remove the nitrogen fertilizer residue from drinking water to keep it within safe standards. Some of that fertilizer runs into the nation's rivers, worsening a dead zone in the Gulf of Mexico that can no longer support marine life. Farmers also planted on hilly, erodible soil, which encouraged erosion and the loss of topsoil.

Q: But ethanol helps reduce global warming?

A: That was the intent. But sometimes farmers create cropland by plowing over grassland. Grassland keeps carbon dioxide locked up in the soil. Plow over it, and that gas is released. It can take decades to make up for that loss.

Under Obama, more than 5 million acres of land that had been set aside as conservation land was transformed from grass field back into farmland. That's the size of Yosemite, Yellowstone and Everglades National Parks combined. At least another 1.2 million acres of prairieland in the Great Plains have been plowed over for corn. Many environmentalists and scientists now question whether the ethanol mandate will ever accomplish its primary environmental goal: reducing greenhouse gases.

Q: The ethanol industry disputes those numbers and says no virgin land has been lost. What gives?

A: The government only started tracking this in 2012. The USDA concluded 38,000 acres were lost that year. And farmers in the Dakotas told AP reporters that they were plowing into pristine prairieland. So it's not a question of whether it's happening. The question is on what scale. The government has made it impossible to determine that number precisely. So the AP used the only method available to estimate it: Government crop data collected by satellite. The AP identified tracts of land that were cornfields in 2012 and had been grassland in 2006. The AP then excluded land lost from the Conservation Reserve Program to prevent double counting. The AP vetted this methodology with an independent scientist at South Dakota State University who has published peer-review research on land conversion using the same satellite data.

Q: This must have been factored into the equation when the government wrote this policy, right?

A: Quite the opposite. Scientists and environmental groups warned this might happen but the government and powerful agriculture companies argued it wouldn't. By law, the Environmental Protection Agency was supposed to study whether air and water quality have suffered because of the ethanol policy. That never happened.

Q: We're talking about corn. Like corn you eat in the summer?

A: Not really. That's sweet corn. And it actually makes up only a small percentage of the corn grown in America. Historically, the overwhelming majority of corn grown in America goes toward livestock feed. In the mid-to-late 1990s, about 75 percent of corn went to livestock. Following the ethanol mandate, more corn has been planted and more of it is going to fuel. According to the Department of Agriculture, which has been tracking this for decades, 2010 was the first year on record in which more corn went to fuel than to livestock feed. That was true again in 2011 and 2012. This year, about 43 percent of corn went to fuel and 45 percent to livestock feed.

The ethanol industry argues those figures are misleading because the distillation process leaves behind a residual byproduct that can be used for livestock feed. That byproduct is not measured in the official government data. But however you run the numbers, it's true that more corn is going toward ethanol.

Q: You don't hear a lot about this.

A: Maybe because green is definitely a hot color: Green energy, green jobs, the green economy. But the truth is all energy has costs associated with it.

Everyone knows the environmental cost of oil and natural gas. But the Obama administration rarely acknowledges that its green initiatives have costs, too. And the government allows green companies to do not-so-green things. For wind power, that means the government looks the other way as turbines kill eagles in violation of federal law. For ethanol, the government accepts the environmental consequences in hopes the industry will develop cleaner next-generation biofuels.

Q: So bottom line, is ethanol better for the environment than oil?

A: It depends how you define "better." Burning ethanol releases less carbon dioxide into the atmosphere than burning gasoline. There's no big worry about ethanol spills that might pollute the ocean or kill wildlife. And some ethanol replaced MTBE, the toxic gasoline additive that was terrible for water pollution.

But when you factor in land conversion — and the erosion, pollution and greenhouse gases that come with it — ethanol doesn't look as good. Independent scientists say it's tough to make a case for ethanol as long as farmers are plowing over virgin prairie and conservation land. That's why ethanol industry executives don't always factor those effects into their calculations when they say their product is far cleaner than oil.

Trying to determine the effects of one policy in an interconnected global economy is hard enough. Figuring out the environmental effects of that policy is even more complicated. So scientists usually rely on economic and environmental models to estimate the effects. Some studies make ethanol look terrible. Some studies make it look great.

It all depends on what the model looks like and how much land conversion you assume. Bob Dinneen, president of the Renewable Fuels Association, told the AP that "the science is most certainly not there" to model land conversion at all.

Even some of the research being promoted by the ethanol industry isn't cut and dried. For instance, the industry points to a Dutch study that found that urban sprawl internationally was responsible for greater grassland loss than biofuels. But that study, which wasn't peer-reviewed, contains this line, which the ethanol industry does not emphasize: "In the USA, biofuel expansion is the dominant cause of agricultural land use loss."

Q: Then why does the government keep this going?

A: The administration could waive the ethanol requirements and Congress could rewrite the law. That hasn't happened in part because of politics. Abandoning this policy would put the corn-friendly Obama administration on the side of Big Oil, which hates the ethanol mandate. Agriculture interests wield a lot of clout in Congress. And then there are the Iowa caucuses, which can obliterate the dreams of presidential hopefuls who are seen as anti-farmer.

But the administration knows the ethanol mandate hasn't lived up to its environmental promises. Today, when officials talk about it, they are more likely to cast it as an economic lifeline for rural America, not as a green-energy plan.

DON'T MISS

- **Boeing jumbo jet lands at wrong Kansas airport**
  19 days ago
- **Long-running societal divide fuels Thai conflict**
  8 days ago
- **India refuses to budge on subsidies at WTO talks**
  6 days ago
- **3 Ways Guys Can Drop 20lbs Quickly** *Ad*
  5 days ago
- **15 NFL Cheerleaders Who Should Put on More Clothes** *Ad*
  55 days ago
- **7 Healthy Foods that Turned Out to Be Unhealthy** *Ad*
  36 days ago

Zomanta

Tags

Government and politics, Barack Obama, United States, Industries, Business, Iowa, United States Congress, United States government, Legislature, Industry regulation, Government business and finance, Government regulations, Agriculture, Environmental concerns, Environment, Environment and nature, Economy, Utilities, Science, Agriculture and the environment, George W. Bush, Natural resource management, Environmental conservation and

AP

The Big Story

The secret, dirty cost of Obama's green power push

By DINA CAPPIELLO and MATT APUZZO
— Nov. 12, 2013 5:42 AM EST

In this July 20, 2013, photo, a plant that produces ethanol is next to a cornfield near Coon Rapids, Iowa. Government mandates to increase ethanol production have helped drive up corn prices leading to marginal land being farmed to produc the crop. In 2012, 44 percent of the nation's corn crop was used for fuel, about twice the rate seen in 2006, according to the Department of Agriculture. (AP Photo/Charlie Riedel)

- Prev
- 1 of 20
- Next

CORYDON, Iowa (AP) — The hills of southern Iowa bear the scars of America's push for green energy: The brown gashes where rain has washed away the soil. The polluted streams that dump fertilizer into the water supply.

Even the cemetery that disappeared like an apparition into a cornfield.

It wasn't supposed to be this way.

With the Iowa political caucuses on the horizon in 2007, presidential candidate Barack Obama made homegrown corn a centerpiece of his plan to slow global warming. When President George W. Bush signed a law that year requiring oil companies to add billions of gallons of ethanol to their gasoline each year, Bush predicted it would make the country "stronger, cleaner and more secure."

But the ethanol era has proven far more damaging to the environment than politicians promised and much worse than the government admits today.

As farmers rushed to find new places to plant corn, they wiped out millions of acres of conservation land, destroyed habitat and contaminated water supplies, an Associated Press investigation found.

Five million acres of land set aside for conservation — more than Yellowstone, Everglades and Yosemite National Parks combined — have been converted on Obama's watch.

Landowners filled in wetlands. They plowed into pristine prairies, releasing carbon dioxide that had been locked in the soil.

Sprayers pumped out billions of pounds of fertilizer, some of which seeped into drinking water, polluted rivers and worsened the huge dead zone in the Gulf of Mexico where marine life can't survive.

The consequences are so severe that environmentalists and many scientists have now rejected corn-based ethanol as bad environmental policy. But the Obama administration stands by it, highlighting its benefits to the farming industry rather than any negative consequences.

All energy comes at a cost. The environmental consequences of drilling for oil and natural gas are well documented and severe. But in the president's push to reduce greenhouse gases and curtail global warming, his administration has allowed so-called green energy to do not-so-green things.

In some cases, such as the decision to allow wind farms that sometimes kill eagles, the administration accepts environmental costs because they pale in comparison to the havoc global warming could ultimately cause.

In the case of ethanol, the administration believes it must encourage the development of next-generation biofuels that will someday be cleaner and greener than today's.

"That is what you give up if you don't recognize that renewable fuels have some place here," EPA administrator Gina McCarthy said. "All renewable fuels are not corn ethanol."

But next-generation biofuels haven't been living up to expectations. And the government's predictions on ethanol have proven so inaccurate that independent scientists question whether it will ever achieve its central environmental goal: reducing greenhouse gases.

That makes the hidden costs even more significant.

"They're raping the land," said Bill Alley, a Democratic member of the board of supervisors in Wayne County, Iowa, which now bears little resemblance to the rolling cow pastures shown in postcards sold at a Corydon town pharmacy.

The numbers behind the ethanol mandate have become so unworkable that, for the first time, the EPA is soon expected to

reduce the amount of ethanol required to be added to the gasoline supply. An unusual coalition of big oil companies, environmental groups and food companies is pushing the government to go even further and reconsider the entire ethanol program.

But the Obama administration stands by the mandate and rarely acknowledges that green energy requires any trade-offs.

"There is no question air quality, water quality is benefiting from this industry," Agriculture Secretary Tom Vilsack told ethanol lobbyists recently.

But the administration has never conducted studies to determine whether that's true.

Fertilizer, for instance, can make drinking water toxic. Children are especially susceptible to nitrate poisoning, which causes "blue baby" syndrome and can be deadly.

Between 2005 and 2010, corn farmers increased their use of nitrogen fertilizer by more than a billion pounds. More recent data isn't available from the Agriculture Department, but conservative projections suggest another billion-pound increase since then.

In the Midwest, where corn is the dominant crop, some are sounding alarms.

The Des Moines Water Works has faced high nitrate levels for many years in the Des Moines and Raccoon rivers, which supply drinking water to 500,000 people. Typically, when pollution is too high in one river, workers draw from the other.

"This year, unfortunately the nitrate levels in both rivers were so high that it created an impossibility for us," said Bill Stowe, the utility's general manager.

For three months this summer, huge purifiers churned around the clock to meet demand for safe, clean water.

Obama's support for ethanol dates to his time as a senator form Illinois, the nation's second-largest corn producer.

"If we're going to get serious about investing in our energy future, we must give our family farmers and local ethanol producers a fair shot at success," Obama said in 2007.

From the beginning of his presidential administration, however, Obama's environmental team saw corn ethanol as a dubious policy. Corn demands fertilizer, which is made using natural gas. What's worse, ethanol factories typically burn coal or gas, both of which release carbon dioxide.

Then there's the land conversion, the most controversial and difficult-to-predict outcome.

Digging up grassland releasas greenhouse gases, so environmentalists are skeptical of anything that encourages planting more corn.

"I don't remember anybody having great passion for this," said Bob Sussman, who served on Obama's transition team and recently retired as the Environmental Protection Agency's senior policy counsel. "I don't have a lot of personal enthusiasm for the program."

There was plenty enthusiasm at the White House and at the Department of Agriculture, where officials argued to the EPA that ethanol was cleaner than it thought. The EPA ultimately agreed.

The policy hinged on assumptions that corn prices would not go too high and farms would get more efficient. That way, there

wouldn't be much incentive to plow untouched areas and destroy conservation land.

But corn prices climbed to more than $7 a bushel, about twice the administration's long-term prediction. Suddenly, setting aside land for conservation was bad economics for many farmers.

"I'm coming to the point where financially, it's not feasible," said Leroy Perkins, a farmer in Wayne County who set aside 91 acres years ago and let it grow into high grass.

Losing millions of conservation acres was bad. Plowing over untouched prairies was worse.

Using satellite data — the best tool available — The Associated Press identified at least 1.2 million acres of virgin land in Nebraska and the Dakotas that have been converted to corn and soybean fields since 2006.

"The last five years, we've become financially solvent," said Robert Malsam, a farmer in Edmunds County, S.D., who like others in the Dakotas has plowed wild grassland to expand his corn crop.

The government could change the mandate or demand more safeguards. But that would pick a fight with agricultural lobbyists and would put the administration on the side of oil companies, which despise the ethanol requirement.

Bob Dinneen, president of the Renewable Fuels Association, the ethanol lobbying group, said there's no reason to change anything. Ethanol is still cleaner than oil, he said.

These days, when administration officials discuss ethanol, they often frame it as an economic program for rural America, not an environmental policy.

When Obama gave a major speech in June on reducing greenhouse gas, biofuels received only a passing reference.

With the government's predictions so far off from reality, scientists say it's hard to argue for ethanol as global warming policy.

"I'd have to think really hard to come up with a scenario where it's a net positive," said Silvia Secchi, a Southern Illinois University agriculture economist.

She paused, then added: "I'm stumped."

Associated Press writers Jack Gillum in Washington and Chet Brokaw in Roscoe, S.D., contributed to this report.

DON'T MISS

- **Pot farm poilution: Too dangerous to deal with?**
- **Millions spent on water-storage plan that leaks**
- **Corn rises as farmers leave more land unplanted**
- **3 Ways Guys Can Drop 20lbs Quickly** *Ad*
- **15 NFL Cheerleaders Who Should Put on More Clothes** *Ad*
- **7 Healthy Foods that Turned Out to Be Unhealthy** *Ad*

Zemanta

AP

The Big Story

The secret environmental cost of US ethanol policy

By DINA CAPPIELLO and MATT APUZZO
— Nov. 12, 2013 4:59 PM EST

In this July 20, 2013, photo, a plant that produces ethanol is next to a cornfield near Coon Rapids, Iowa. Government mandates to increase ethanol production have helped drive up corn prices leading to marginal land being farmed to produc the crop. In 2012, 44 percent of the nation's corn crop was used for fuel, about twice the rate seen in 2006, according to the Department of Agriculture. (AP Photo/Charlie Riedel)

- Prev
- 1 of 20
- Next

CORYDON, Iowa (AP) — The hills of southern Iowa bear the scars of America's push for green energy: The brown gashes where rain has washed away the soil. The polluted streams that dump fertilizer into the water supply.

Even the cemetery that disappeared like an apparition into a cornfield.

It wasn't supposed to be this way.

With the Iowa political caucuses on the horizon in 2007, presidential candidate Barack Obama made homegrown corn a centerpiece of his plan to slow global warming. And when President George W. Bush signed a law that year requiring oil companies to add billions of gallons of ethanol to their gasoline each year, Bush predicted it would make the country "stronger, cleaner and more secure."

But the ethanol era has proven far more damaging to the environment than politicians promised and much worse than the government admits today.

As farmers rushed to find new places to plant corn, they wiped out millions of acres of conservation land, destroyed habitat and polluted water supplies, an Associated Press investigation found.

Five million acres of land set aside for conservation — more than Yellowstone, Everglades and Yosemite National Parks combined — have vanished on Obama's watch.

Landowners filled in wetlands. They plowed into pristine prairies, releasing carbon dioxide that had been locked in the soil.

Sprayers pumped out billions of pounds of fertilizer, some of which seeped into drinking water, contaminated rivers and worsened the huge dead zone in the Gulf of Mexico where marine life can't survive.

The consequences are so severe that environmentalists and many scientists have now rejected corn-based ethanol as bad environmental policy. But the Obama administration stands by it, highlighting its benefits to the farming industry rather than any negative impact.

Farmers planted 15 million more acres of corn last year than before the ethanol boom, and the effects are visible in places like south central Iowa.

The hilly, once-grassy landscape is made up of fragile soil that, unlike the earth in the rest of the state, is poorly suited for corn. Nevertheless, it has yielded to America's demand for it.

"They're raping the land," said Bill Alley, a member of the board of supervisors in Wayne County, which now bears little resemblance to the rolling cow pastures shown in postcards sold at a Corydon pharmacy.

All energy comes at a cost. The environmental consequences of drilling for oil and natural gas are well documented and severe. But in the president's push to reduce greenhouse gases and curtail global warming, his administration has allowed so-called green energy to do not-so-green things.

In some cases, such as its decision to allow wind farms to kill eagles, the administration accepts environmental costs because they pale in comparison to the havoc it believes global warming could ultimately cause.

Ethanol is different.

The government's predictions of the benefits have proven so inaccurate that independent scientists question whether it will ever achieve its central environmental goal: reducing greenhouse gases. That makes the hidden costs even more significant.

"This is an ecological disaster," said Craig Cox with the Environmental Working Group, a natural ally of the president that, like others, now finds itself at odds with the White House.

But it's a cost the administration is willing to accept. It believes supporting corn ethanol is the best way to encourage the development of biofuels that will someday be cleaner and greener than today's. Pulling the plug on corn ethanol, officials fear, might mean killing any hope of these next-generation fuels.

"That is what you give up if you don't recognize that renewable fuels have some place here," EPA administrator Gina McCarthy said in a recent interview with AP. "All renewable fuels are not corn ethanol."

Still, corn supplies the overwhelming majority of ethanol in the United States, and the administration is loath to discuss the environmental consequences.

"It just caught us completely off guard," said Doug Davenport, a Department of Agriculture official who encourages southern Iowa farmers to use conservation practices on their land. Despite those efforts, Davenport said he was surprised at how much fragile, erodible land was turned into corn fields.

Shortly after Davenport spoke to The Associated Press, he got an email ordering him to stop talking.

"We just want to have a consistent message on the topic," an Agriculture Department spokesman in Iowa said.

That consistent message was laid out by Agriculture Secretary Tom Vilsack, who spoke to ethanol lobbyists on Capitol Hill recently and said ethanol was good for business.

"We are committed to this industry because we understand its benefits," he said. "We understand it's about farm income. It's about stabilizing and maintaining farm income which is at record levels."

The numbers behind the ethanol mandate have become so unworkable that, for the first time, the EPA is soon expected to reduce the amount of ethanol required to be added to the gasoline supply. An unusual coalition of big oil companies, environmental groups and food companies is pushing the government to go even further and reconsider the entire ethanol program.

The ethanol industry is fighting hard against that effort. Industry spokesman Brooke Coleman dismissed this story as "propaganda on a page." An industry blog in Minnesota said the AP had succumbed "to Big Oil's deep pockets and powerful influence."

To understand how America got to an environmental policy with such harmful environmental consequences, it's helpful to start in a field in Iowa.

Leroy Perkins, a white-haired, 66-year-old farmer in denim overalls, stands surrounded by waist-high grass and clover. He owns 91 acres like this, all hilly and erodible, that he set aside for conservation years ago.

Soon, he will have a decision to make: keep the land as it is or, like many of his neighbors, plow it down and plant corn or soybeans, the major sources of biofuel in the United States.

"I'd like to keep it in," he said. "This is what southern Iowa's for: raising grass."

For decades, the government's Conservation Reserve Program has paid farmers to stop farming environmentally sensitive land. Grassy fields naturally convert carbon dioxide into oxygen, which helps combat global warming. Plus, their deep root systems prevent topsoil from washing away.

For Perkins and his farmer neighbors in Wayne County, keeping farmland in conservation wasn't just good stewardship. It made financial sense.

A decade ago, Washington paid them about $70 an acre each year to leave their farmland idle. With corn selling for about $2 per bushel (56 pounds) back then, farming the hilly, inferior soil was bad business.

Many opted into the conservation program. Others kept their grasslands for cow pastures.

Lately, though, the math has changed.

"I'm coming to the point where financially, it's not feasible," Perkins said.

The change began in 2007, when Congress passed a law requiring oil companies to blend billions of gallons of ethanol into gasoline.

Oil prices were high. Oil imports were rising quickly. The legislation had the strong backing of the presidential candidate who was the junior senator from neighboring Illinois, the nation's second-largest corn producer.

"If we're going to get serious about investing in our energy future, we must give our family farmers and local ethanol producers a fair shot at success," Obama said then.

The Democratic primary field was crowded, and if he didn't win the Iowa caucuses the road to the nomination would be difficult. His strong support for ethanol set him apart.

"Any time we could talk about support for ethanol, we did," said Mitch Stewart, the battleground states director for Obama's 2008 campaign. "It's how we would lead a lot of discussions."

President Bush signed the bill that December.

It would fall on the next president to figure out how to make it work.

President Obama's team at the EPA was sour on the ethanol mandate from the start.

As a way to reduce global warming, they knew corn ethanol was a dubious proposition. Corn demands fertilizer, which is made using natural gas. What's worse, ethanol factories typically burn coal or gas, both of which release carbon dioxide.

Then there was the land conversion, the most controversial and difficult-to-predict outcome.

Digging up grassland releases greenhouse gases, so environmentalists are skeptical of any program that encourages planting more corn.

"I don't remember anybody having great passion for this," said Bob Sussman, who served on Obama's transition team and recently retired as EPA's senior policy counsel. "I don't have a lot of personal enthusiasm for the program."

At the White House and the Department of Agriculture, though, there was plenty of enthusiasm.

One of Obama's senior advisers, Pete Rouse, had worked on ethanol issues as chief of staff to Sen. Tom Daschle of South Dakota, a major ethanol booster and now chair of the DuPont Advisory Committee on Agriculture Innovation and Productivity.

Another Obama adviser at the time, Heather Zichal, grew up in northeast Iowa — as a child, she was crowned "sweet corn princess" — and was one of the Obama campaign's leading voices on ethanol in her home state.

The administration had no greater corn ethanol advocate than Vilsack, the former Iowa governor.

"Tom understands that the solution to our energy crisis will be found not in oil fields abroad but in our farm fields here at home," Obama said in 2008. "That is the kind of leader I want in my Cabinet."

—

Writing the regulations to implement the ethanol mandate was among the administration's first major environmental undertakings. Industry and environmental groups watched closely.

The EPA's experts determined that the mandate would increase demand for corn and encourage farmers to plow more land. Considering those factors, they said, corn ethanol was only slightly better than gasoline when it came to carbon dioxide emissions.

Sixteen percent better, to be exact. And not in the short term. Only by 2022.

By law, though, biofuels were supposed to be at least 20 percent greener than gasoline.

From a legal standpoint, the results didn't matter. Congress exempted existing coal- and gas-burning ethanol plants from meeting this standard.

But as a policy and public relations issue, it was a real problem. The biofuel-friendly Obama administration was undermining the industry's major selling point: that it was much greener than gasoline.

So the ethanol industry was livid. Lobbyists flooded the EPA with criticism, challenging the government's methods and conclusions.

The EPA's conclusion was based on a model. Plug in some assumed figures — the price of corn, the number of acres planted, how much corn would grow per acre — and the model would spit out a number.

To get past 20 percent, the EPA needed to change its assumptions.

The most important of those assumptions was called the yield, a measure of how much corn could be produced on an acre of land. The higher the yield, the easier it would be for farmers to meet the growing demand without plowing new farmland, which counted against ethanol in the greenhouse gas equation.

Corn yields have inched steadily upward over the years as farms have become more efficient. The government's first ethanol model assumed that trend would continue, rising from 150 bushels per acre to about 180 by the year 2022.

Agriculture companies like Monsanto Co. and DuPont Pioneer, which stood to make millions off an ethanol boom, told the government those numbers were too low.

They predicted that genetically modified seeds — which they produce — would send yields skyrocketing. With higher yields, farmers could produce more corn on less land, reducing the environmental effects.

Documents show the White House budget office also suggested the EPA raise its yield assumptions.

When the final rule came out, the EPA and Agriculture officials added a new "high yield case scenario" that assumed 230 bushels per acre.

The flaw in those assumptions, independent scientists knew, was that a big increase in corn prices would encourage people to farm in less hospitable areas like Wayne County, which could never produce such large yields.

But the EPA's model assumed only a tiny increase in corn prices.

"You adjust a few numbers to get it where you want it, and then you call it good," said Adam Liska, assistant professor of biological systems engineering at the University of Nebraska. He supports ethanol, even with its environmental trade-offs.

When the Obama administration finalized its first major green-energy policy, corn ethanol barely crossed the key threshold. The final score: 21 percent.

"If you corrected any of a number of things, it would be on the other side of 20 percent," said Richard Plevin of the Transportation Sustainability Research Center at the University of California, Berkeley. "Is it a coincidence this is what happened? It certainly makes me wonder."

It didn't take long for reality to prove the Obama administration's predictions wrong.

The regulations took effect in July 2010. The following month, corn prices already had surpassed the EPA's long-term estimate of $3.22 a bushel. That September, corn passed $4, on its way to about $7, where it has been most of this year.

Yields, meanwhile, have held fairly steady.

But the ethanol boom was underway.

It's impossible to precisely calculate how much ethanol is responsible for the spike in corn prices and how much those prices led to the land changes in the Midwest.

Supporters of corn ethanol say extreme weather — dry one year, very wet the next — hurt farmers and raised prices.

But diminishing supply wasn't the only factor. More corn than ever was being distilled into ethanol.

Historically, the overwhelmingly majority of corn in the United States has been turned into livestock feed. But in 2010, for the first time, fuel was the No. 1 use for corn in America. That was true in 2011 and 2012. Newly released Department of Agriculture data show that, this year, 43 percent of corn went to fuel and 45 percent went to livestock feed.

The more corn that goes to ethanol, the more that needs to be planted to meet other demands.

Scientists predicted that a major ethanol push would raise prices and, in turn, encourage farmers like Leroy Perkins to plow into conservation land. But the government insisted otherwise.

In 2008, the journal Science published a study with a dire conclusion: Plowing over conservation land releases so much greenhouse gas that it takes 48 years before new plants can break even and start reducing carbon dioxide.

For an ethanol policy to work, the study said, farmers could not plow into conservation land.

The EPA, in a report to Congress on the environmental effects of ethanol, said it was "uncertain" whether farmers would plant on farmland that had been set aside for conservation.

The Department of Energy was more certain. Most conservation land, the government said in its response to the study, "is unsuitable for use for annual row crop production."

America could meet its ethanol demand without losing a single acre of conservation land, Energy officials said.

They would soon be proven wrong.

Before the government ethanol mandate, the Conservation Reserve Program grew every year for nearly a decade. Almost overnight, farmers began leaving the program, which simultaneously fell victim to budget cuts that reduced the amount of farmland that could be set aside for conservation.

In the first year after the ethanol mandate, more than 2 million acres disappeared.

Since Obama took office, 5 million more acres have vanished.

Agriculture officials acknowledge that conservation land has been lost, but they say the trend is reversing. When the 2013 data comes out, they say it will show that as corn prices stabilized, farmers once again began setting aside land for conservation.

Losing conservation land was bad. But something even worse was happening.

Farmers broke ground on virgin land, the untouched terrain that represents, from an environmental standpoint, the country's most important asset.

The farm industry assured the government that wouldn't happen. And it would have been an easy thing for Washington to check.

But rather than insisting that farmers report whenever they plow into virgin land, the government decided on a much murkier oversight method: Washington instead monitors the total number of acres of cropland nationwide. Local trends wash away when viewed at such a distance.

"They could not have designed a better approach to not detect land conversion," said Ben Larson, an agricultural expert for the National Wildlife Federation.

Look closely at the corn boom in the northern Great Plains, however, and it's clear. Farmers are converting untouched prairie into farmland.

The Department of Agriculture began keeping figures on virgin land only in 2012 and determined that about 38,000 acres vanished that year.

But using government satellite data — the best tool available — the AP identified a conservative estimate of 1.2 million acres of virgin land in Nebraska and the Dakotas alone that have been converted to fields of corn and soybeans since 2006, the last year before the ethanol mandate was passed.

"The last five years, we've become financially solvent," said Robert Malsam, a farmer in Edmunds County, S.D., who like

others in the central and eastern Dakotas has plowed into wild grassland to expand his corn crop.

The price of corn is reshaping the land across the Midwest. In Wayne County, Iowa, for example, only the dead can stop the corn.

A gravel road once cut through a grassy field leading to a hilltop cemetery. But about two years ago, the landowners plowed over the road. Now, visiting gravesites means walking a narrow path through the corn.

People have complained. It's too narrow for a hearse, too rutted for a wheelchair, too steep for the elderly. But it's legal, said Bill Alley from the board of supervisors.

"This is what the price of corn does," he said. "This is what happens, right here."

When Congress passed the ethanol mandate, it required the EPA to thoroughly study the effects on water and air pollution. In his recent speech to ethanol lobbyists, Vilsack was unequivocal about those effects:

"There is no question air quality, water quality is benefiting from this industry," he said.

But the administration never actually conducted the required air and water studies to determine whether that's true.

In an interview with the AP after his speech, Vilsack said he didn't mean that ethanol production was good for the air and water. He simply meant that gasoline mixed with ethanol is cleaner than gasoline alone.

In the Midwest, meanwhile, scientists and conservationists are sounding alarms.

Nitrogen fertilizer, when it seeps into the water, is toxic. Children are especially susceptible to nitrate poisoning, which causes "blue baby" syndrome and can be deadly.

Between 2005 and 2010, corn farmers increased their use of nitrogen fertilizer by more than one billion pounds. More recent data isn't available from the Agriculture Department, but because of the huge increase in corn planting, even conservative projections by the AP suggest another billion-pound fertilizer increase on corn farms since then.

Department of Agriculture officials note that the amount of fertilizer used for all crops has remained steady for a decade, suggesting the ethanol mandate hasn't caused a fertilizer boom across the board.

But in the Midwest, corn is the dominant crop, and officials say the increase in fertilizer use — driven by the increase in corn planting — is having an effect.

The Des Moines Water Works, for instance, has faced high nitrate levels for many years in the Des Moines and Raccoon Rivers, which supply drinking water to 500,000 people. Typically, when pollution is too high in one river, workers draw from the other.

"This year, unfortunately the nitrate levels in both rivers were so high that it created an impossibility for us," said Bill Stowe, the water service's general manager.

For three months this summer, workers kept huge machines running around the clock to clean the water. Officials asked customers to use less water so the utility had a chance to keep up.

Part of the problem was that last year's dry weather meant fertilizer sat atop the soil. This spring's rains flushed that nitrogen into the water along with the remnants of the fertilizer from the most recent crop.

At the same time the ethanol mandate has encouraged farmers to plant more corn, Stowe said, the government hasn't done enough to limit fertilizer use or regulate the industrial drainage systems that flush nitrates and water into rivers and streams.

With the Water Works on the brink of capacity, Stowe said he's considering suing the government to demand a solution.

In neighboring Minnesota, a government report this year found that significantly reducing the high levels of nitrates from the state's water would require huge changes in farming practices at a cost of roughly $1 billion a year.

"We're doing more to address water quality, but we are being overwhelmed by the increase in production pressure to plant more crops," said Steve Morse, executive director of the Minnesota Environmental Partnership.

The nitrates travel down rivers and into the Gulf of Mexico, where they boost the growth of enormous algae fields. When the algae die, the decomposition consumes oxygen, leaving behind a zone where aquatic life cannot survive.

This year, the dead zone covered 5,800 square miles of sea floor, about the size of Connecticut.

Larry McKinney, the executive director of the Harte Institute at Texas A&M University-Corpus Christi, says the ethanol mandate worsened the dead zone.

"On the one hand, the government is mandating ethanol use," he said, "and it is unfortunately coming at the expense of the Gulf of Mexico."

The dead zone is one example among many of a peculiar ethanol side effect: As one government program encourages farmers to plant more corn, other programs pay millions to clean up the mess.

Obama administration officials know the ethanol mandate hasn't lived up to its billing.

The next-generation biofuels that were supposed to wean the country off corn haven't yet materialized. Every year, the EPA predicts millions of gallons of clean fuel will be made from agricultural waste. Every year, the government is wrong.

Every day without those cleaner-burning fuels, the ethanol industry stays reliant on corn and the environmental effects mount.

The EPA could revisit its model and see whether ethanol is actually as good for the environment as officials predicted. But the agency says it doesn't have the money or the manpower.

Even under the government's optimistic projections, the ethanol mandate wasn't going to reduce greenhouse gas right away. And with the model so far off from reality, independent scientists say it's hard to make an argument for ethanol as a global warming policy.

"I'd have to think really hard to come up with a scenario where it's a net positive," said Silvia Secchi, a Southern Illinois University agriculture economist.

She paused a few moments, then added, "I'm stumped."

In June, when Obama gave a major policy speech on reducing greenhouse gas, he didn't mention ethanol. Biofuels in

general received a brief, passing reference.

What was once billed as an environmental boon has morphed into a government program to help rural America survive.

"I don't know whether I can make the environmental argument, or the economic argument," Vilsack said in an interview with the AP. "To me, it's an opportunity argument."

Congress and the administration could change the ethanol mandate, tweak its goals or demand more safeguards. Going to Congress and rewriting the law would mean picking a fight with agricultural lobbyists, a fight that would put the administration on the side of big oil companies, which despise the ethanol requirement.

So the ethanol policy cruises on autopilot.

Bob Dinneen, president of the Renewable Fuels Association, the ethanol lobbying group, said there's no reason to change the standards. Ethanol still looks good compared to the oil industry, which increasingly relies on environmentally risky tactics like hydraulic fracturing or pulls from carbon-heavy tar sands.

Leroy Perkins, the farmer agonizing about what to do with his 91 acres, says he likes ethanol as a product and an industry. But he knows it fuels the corn prices that are transforming his county.

"If they do change the fuel standard, you'll see the price of corn come down overnight," he said. "I like to see a good price for corn. But when it's too high, it hurts everybody."

Investors from as far away as Maryland and Pennsylvania have bought thousands of acres in Wayne County, sending prices skyrocketing from $350 per acre a decade ago to $5,000 today.

One in every four acres of in the county is now owned by an out-of-towner.

Those who still own land often rent it to farming companies offering $300 or more per acre. Perkins could make perhaps $27,000 a year if he let somebody plant corn on his land. That's nothing to dismiss in a county where typical household income is $36,000.

But he knows what that means. He sees the black streaks in his neighbor's cornfields, knowing the topsoil washes away with every rain. He doesn't want that for his family's land.

"You have to decide, do you want to be the one to..."

He doesn't finish his sentence.

"We all have to look at our pocketbooks."

Associated Press writers Jack Gillum in Washington and Chet Brokaw in Roscoe, S.D., contributed to this report.

DON'T MISS

- **Long-running societal divide fuels Thai conflict**
- **As wine fakers get sharper, industry fights back**

Senator VITTER. OK. Further highlighting my point is the absence of the Energy Information Administration. We asked that the EIA be invited to testify but, unfortunately, that request was denied. So, in an effort to conduct meaningful oversight, we sent a letter to EIA this morning asking for their input and certainly will receive that and make that part of the overall record.

Senator BOXER. Yes.

[The referenced information was not received at time of print.]

Senator VITTER. The folks who wrote the RFS had laudable goals in mind at the time. But I believe it is really time to admit that the RFS is fundamentally flawed and limps along year after year, mostly benefiting a small sector of our economy committed to Government mandates while also causing real damage and dislocation to others, including the American consumer.

A few facts. The USDA has said that the mandate played a part in driving up U.S. food prices 3 to 4 percent last year. The World Bank says that corn-based ethanol in the U.S. is driving up grain prices by up to 8 percent worldwide. The program consumes about 40 percent of the corn we grow so, clearly, that drives higher food prices. Even the EU figured this out. In September, they limited the amount of fuel that can be developed from food-based crops to 6 percent.

Automakers have announced that fueling your car with higher than 10 percent ethanol blends will void warranties. The American Automobile Association warns consumers not to fill up their cars with E15. So, this program is really dangerous for folks who drive as well. Just a quick picture says that better than I can. It is now a real marketing push to advertise gasoline with no ethanol.

Certainly the program was intended to enhance energy security. Certainly we all agree with that goal. But it actually turns out that its structure sometimes means that, for instance, domestic corn ethanol made here in the U.S. is actually traded for imported Brazilian sugarcane ethanol.

Each year since enactment the lack of production of advanced biofuels in meaningful volumes has forced EPA to reduce the cellulosic volume requirement. Still, EPA, I think, exaggerates production, leaving refiners to either purchase more of a product that does not exist or pay a fine. And that is bad for consumers.

Earlier this year, Congress, including myself, asked EPA to use their flexibility under the statute to waive the required amounts of biofuels to be blended into our gasoline. They have taken some action, but I am very concerned that is a temporary Band-Aid and we really need some more wholesale look at this law.

So, I look forward to doing that, to that more holistic approach.

[The prepared statement of Senator Vitter follows:]

STATEMENT OF HON. DAVID VITTER,
U.S. SENATOR FROM THE STATE OF LOUISIANA

Thank you, Chairman Boxer and Chairman Carper for convening today's hearing. I would also like to thank our witnesses for being here as well. With this limited opportunity for review of the program I'd like to commend you for being selected to testify.

Not present today are other stakeholders, like poultry producers, food products manufacturers, boat owners, motorcycle enthusiasts, small engine manufacturers, biodiesel producers, gas station owners, conservation groups, and even bakers. Many of these groups have sent letters that I ask be included in the record.

Further highlighting my point is the absence of the Energy Information Administration (EIA). We asked that the EIA be invited to testify and our request was denied. In an effort to conduct meaningful oversight we sent a letter to EIA this morning asking for their input.

The people who wrote the RFS had laudable goals in mind at the time, but it's time to admit that the RFS is a fundamentally flawed program that limps along year after year benefiting a small sector of our economy committed to government mandates, while simultaneously wreaking havoc on those required to participate—particularly the American consumer.

The USDA has said that the mandate played a part in driving up U.S. food prices 3 to 4 percent last year. The World Bank says that corn-based ethanol in the United States is driving up grain prices by as much as 8 percent worldwide.

So this program, which consumes approximately 40 percent of the corn we grow, leads directly to higher food prices. Even the EU figured this out—in September they limited the amount of fuel that can be developed from food-based crops to 6 percent.

Automakers have announced that fueling your car with higher than 10 percent ethanol blends will void warranties. The American Automobile Association warns consumers not to fill up their cars with E15. So this program is a bad deal for people who drive in the United States as well.

While the program was intended to enhance our domestic energy security, it turns out its structure sometimes means that domestic corn ethanol made here in the U.S. is traded for imported Brazilian sugarcane ethanol.

Each year since enactment, the lack of production of advanced biofuels in any meaningful volumes has forced EPA to reduce the cellulosic volume requirements. Still EPA exaggerates production, leaving refiners to either purchase more of a product that doesn't exist or pay a fine: That doesn't make sense.

Earlier this year, some in Congress, including myself, asked EPA to use their considerable flexibility under the statute to waive the required amounts of biofuels to be blended into our gasoline and diesel, thus avoiding the ethanol blend wall. Predictions made in 2007 of increasing fuel demand turned out to be just the opposite: demand is actually decreasing.

With the proposed 2014 Renewable Volume Obligations, EPA admitted the program is irretrievably broken, recognized the blend wall, and illustrated the RFS needs to be legislatively restructured from top to bottom.

In an honest attempt to help the drivers, low-income families, and consumers who suffer when corn prices are high, some propose changing the law to strike the requirement to blend corn-based ethanol into the gasoline supply.

That is commendable, but it is a half-answer. The RFS includes four different mandates. Eliminating, limiting, or reducing only one will solve one problem, while potentially exacerbating or creating a host of others.

Taking a holistic approach at reviewing and restructuring the program is a bipartisan, multi-region approach Senator Cardin and I have discussed and continue to develop, fully expecting to craft a long-term policy solution to this outdated and increasingly burdensome mandate. We are building support along the way in discussions with Democrats and Republicans. We expect to accomplish this task very soon—early in the new year.

So the RFS program is a disaster for everyone affected by the program, including those trying to put food on the table. We need to address all components of the program. Failing to thoroughly reform the RFS could further lead to the unintended consequences that so often accompany a program mandated by politicians, implemented by bureaucrats, and foisted on consumers.

Again, I would like to thank Chairman Boxer for this hearing, and I look forward to hearing from all of our witnesses.

Senator BOXER. Senators, we are going to put your full statements in the record. We are speaking each 3 minutes. We must end this at 11 a.m. So I am going to, after we speak and the first panel, at 10:15 we will move to the second panel.

I wanted to just say, to clear the record up, that three of the next six panelists were, in fact, supported by the Republicans, the minority, which is what we always do. So, your witnesses will be heard. We cannot hear from 25 witnesses, but you did choose three witnesses.

We are going to go to Senator Cardin.

OPENING STATEMENT OF HON. BENJAMIN L. CARDIN, U.S. SENATOR FROM THE STATE OF MARYLAND

Senator CARDIN. Thank you, Madam Chair.

I am a strong supporter of the Renewable Fuel Standards. It is important for energy security, for our environmental concerns. I am a strong supporter of the Clean Air Act and it is important for our economy.

But I have serious concerns about our current program. I know that Senator Vitter has already put into the record some of the statements from other interests. The National Chicken Counsel and the American Bakery Association have concerns because of corn-based ethanol and its disruption to the cost of corn.

As Senator Vitter pointed out, 40 percent of the domestic production of corn goes to fuel, and the poultry industry is very dependent upon the corn stock for the cost of the production of poultry in this country. Seventy percent is based in corn. The ethanol guaranteed market is there, but there is no guaranteed market for poultry. Poultry has to compete with other foods such as meat and pork, as well as on a global basis.

I also will bring out concerns that we have under the current policy with the National Marine Manufacturing Association. I would like to introduce a copy of their statement as it relates to E15 and safety issues.

There is a better way to structure the RFS program. It needs to be better balanced, for energy security, food security and motor safety. There are more efficient renewable energy sources in the advanced biofuels and that is where we should be focusing our attention.

I join with Senator Vitter in concern in the way the EPA exercised its waiver authority on the blend wall issue. It also included the advanced biofuels in reducing volume which I thought made no sense whatsoever since the blend wall problem is concerning corn ethanol.

I have been trying and working for change under the current law. At the 112th Congress, I introduced legislation that would make the volume cap sensitive to the market conditions of corn. This year, I am working with Senator Vitter to look for a practical way that we can preserve the Renewable Fuel Standard Program, more aggressive reductions on the volume mandates for corn-based ethanol, continued incentives for advanced biofuels in addressing the motor safety issues.

Madam Chairman, our goal is to mitigate the concerns of fuel safety for all consumers and restore market fairness for traditional corn users and assure steady growth and opportunity for truly advanced biofuels from feedstock that do not compromise our food security.

[The referenced statement follows:]

December 9, 2013

Chairwoman Boxer, Ranking Member Vitter and Members of the Environment and Public Works Committee:

The National Marine Manufacturers Association (NMMA) appreciates the opportunity to submit comments to the Environment and Public Works committee regarding the Renewable Fuel Standard (RFS) and the effects of high ethanol fuels on marine engines and equipment.

By way of background, NMMA is the nation's leading recreational marine industry association. Our 1400 members collectively produce over 80 percent of the recreational marine products sold in North America. NMMA represents boat, engine, and accessory parts manufacturers. Recreational boating is a significant driver of the US economy. With 12 million registered boats, recreational boating has a $121 billion economic impact, including direct and indirect spending. Recreational boating is a particularly US based manufacturing industry, directly employing almost 340,000 jobs.

NMMA and the marine industry is not opposed to all ethanol fuel blends. We feel however that the RFS is a deeply flawed legislative mandate which is leading this country in a direction that will significantly harm not only marine engines, but other non-road engines and automobiles, and in turn the consumers of these products.

To truly understand the flaws of the RFS, it is important to look at how this legislation came about and the unrealistic mandates it imposes. The Clean Air Act amendments of 1990 sought to increase automobile efficiency by adding oxygen to gasoline. This was initially done by adding MTBE to gasoline. Unfortunately, once MTBE started appearing in the water supply, a replacement for the oxygen content was needed, and ethanol was introduced as a fuel additive. The desire for the US to shift its dependency from foreign energy sources, lead to efforts by Congress to enact the Renewable Fuel Standard in 2005 and greatly expand its directives again in 2007. The RFS includes subsidies for ethanol producers, relief from environmental laws (RVP waiver) and a guaranteed market for ethanol led to the over expansion of this industry. The most significant driver of the RFS is the requirement of the 36 billion gallons of renewable fuel to be blended into the transportation fuel supply by 2022.

To achieve the 36 billion gallon renewable fuel requirement, the EPA initially pushed for the proliferation of flex fuel vehicles and the use of E85 fuel. Unfortunately, the consumer demand for flex fuel vehicles and E85 fuel has not been significant enough towards achieving the RFS' mandate. Hence, EPA has recently shifted to allowing more ethanol in the pipeline by raising the blend wall requirements. In 2010, EPA granted a partial waiver, allowing fuel blended with 15 percent ethanol by volume to be used in certain vehicles. The only way for EPA to achieve the mandates of the RFS is to continue to increase the fuel blend wall. This direction, however,

completely ignores the properties of increased ethanol content and the effects on engines not designed or calibrated to operate on such a fuel type.

Ethanol is not gasoline, and the problem is that ethanol contains additional oxygen. As higher quantities of ethanol are blended into base gasoline, oxygen contained in the fuel increases, which leads to engine enleanment. When the fuel changes in the marketplace and additional oxygenates are added—such a by going from E10 gasoline to E15—engines run hotter, causing serious durability issues and increased emissions either in the form of increased Nitrogen Oxides or increased hydrocarbons.

Not only do higher ethanol blends not make logical sense from an emissions standpoint, it simply is destructive to use on many engines in the marketplace today. Driven by a mandate rather than sound science, EPA has allowed E15 to be sold in the marketplace without proper study as to its effects. NMMA members, through the Department of Energy's Renewable Energy Laboratory, studied the effects of E15 on marine engines. The results unequivocally show significant engine damage, poor engine runability, performance and difficult starting. Additional oxygen found in E15 makes the fuel burn hotter, and the higher temperatures can reduce the strength of metallic components. In addition, ethanol can cause compatibility issues with other materials in the fuel system because of the chemical reaction. Our testing proves utilizing high ethanol blends can lead to significant issues for marine engine consumers and can result in premature engine failure. We submit for the record the Department of Energy final report on E15 durability testing on marine engines (See appendix A).

The negative effects of E15 are not only seen in marine engines, but other small and off-road equipment. The overwhelming majority of non-road engines, from chainsaws to weed trimmers to lawn mowers, operate similarly to recreational marine engines with open loop systems including a carburetor that is set at the factory and designed to be—and required by EPA to be--tamper proof. Additionally, the very cars the EPA has allowed E15 to be used, have been tested by the Coordinating Research Council showing substantial damage to automobile engines.

The move towards E15 and possibly even higher blends, to achieve the 36 billion gallon requirement of the RFS is flawed. Rather than continue on a biofuel path that does nothing for lowering emissions and harms our engines, NMMA believes we must freeze the ethanol content of gasoline at its current level of 10% by volume and look towards alternative energy sources that make sense for the engines which must run on them.

Unless Congress takes action to amend the RFS, EPA will continue to push for E15 and possibly higher blend walls. If E15, or even higher blends, become the common marketplace fuel, misfueling will occur, EPA and California emission standards will be violated, engines will be damaged, and the American consumer will be stuck paying the bill for a misguided US government policy.

National Marine Manufacturers Association

NMMA commends EPA's recent proposal to lower the 2014 Renewable Volume Obligations. This is an important step at recognizing the unattainable mandates of the RFS and ensuring the blend wall is not breached in the near term. This regulatory adjustment by the EPA is only a short term fix. EPA is still bound by the strict mandates of the RFS and annual adjustments fail to provide the market certainty NMMA member engineers require in designing their equipment.

NMMA is not anti-ethanol, but simply opposed to fuel blends that will ruin our engines. For the past three years, NMMA has been working with the US Department of Energy and Argonne National Laboratory to evaluate a better alternative to ethanol, both as an oxygenate and a biofuel. Butanol has an energy content closer to that of gasoline, making it more compatible with existing engines and fuel systems. Butanol, is considered an advanced biofuel in the RFS and can be produced from many different types of biomass feedstock, including corn. NMMA has conducted tests on a variety of marine engines and vessels using 16% isobutanol by volume, which has similar oxygen content to E10, without the other negative properties of ethanol identified above. The results of our documented and published research thus far indicate that isobutanol at 16% by volume yields very similar engine emissions, durability, power and performance as E10. NMMA will continue to research alternative fuels that make operability sense.

Unless and until Congress acts on the RFS, EPA will continue to implement the deeply flawed RFS without regard to its ramification on engines or consumers. This is a nonsensical path that creates a fuel supply incompatible with engine technology and makes them prone to failure.

NMMA urges members of this committee to amend the Renewable Fuel Standard in a manner that allows the market to drive fuel choices rather than a hardfast and unworkable mandate. Congress must ensure E10, the fuel for which marine and other small engine equipment operate, remains available in the marketplace. Additionally, as energy policy is mandated by Congress, we must ensure consumer outreach and education is robust. Current actions by the EPA allowing the sale of E15 do little to adequately inform consumers of the prohibited use and harmful effects.

NMMA appreciates the opportunity to submit comments to this committee on such a critical issue for the recreational boating industry. Should you have any questions, please do not hesitate to contact Nicole Vasilaros, Director of Regulatory and Legal Affairs at nvasilaros@nmma.org or 202-737-9763.

Senator BOXER. Thank you, Senator.
Senator Barrasso.

OPENING STATEMENT OF HON. JOHN BARRASSO, U.S. SENATOR FROM THE STATE OF WYOMING

Senator BARRASSO. Thank you, Madam Chairman.

In my view, this hearing is long overdue. The Renewable Fuels Standard, the RFS, is among the most shortsighted energy policies that Congress has ever enacted. The RFS has left a wake of economic and environmental harm that must be put to an end. It has increased food prices for American families, it has increased fuel prices for American motorists, it has contributed to a dirtier environment and now the RFS threatens to cause widespread damage to engines, to fuel systems and our transportation fuel infrastructure.

In June, I, along with Senators Pryor and Toomey, introduced S. 1195, the Renewable Fuel Standard Repeal Act. This is a bipartisan bill and it would repeal the RFS in its entirety. To date, 17 Senators have co-sponsored the bill, including Senators Boozman, Crapo and Inhofe, who are members of this Committee.

I am pleased that a diverse coalition of stakeholders supports this bill including the National Cattlemen's Beef Association, the National Chicken Council, the National Turkey Federation, the American Sheep Industry Association. I would also note that the editorial boards of USA Today, the Washington Post and the Wall Street Journal have all called for the repeal of this mandate.

The debate over the RFS is not a debate between the oil industry and environmentalists. It is a debate between those who recognize that the RFS is fundamentally broken and those who do not. Environmental organizations such as the Environmental Working Group, which is represented here today, recognize that the RFS is broken. Global hunger organizations such as OXFAM and Action Aid also recognize the RFS is broken.

Even the EPA recognizes the status quo cannot continue. Last month, the EPA took a small but historic step. The EPA proposed reducing the total volume of biofuels that suppliers must make available under the RFS. The EPA has proposed this reduction to address issues surrounding the so-called blend wall. The blend wall is the amount of ethanol that can be safely added to the Nation's fuel supply. I applaud the EPA for taking this step and encourage the agency to make further reductions in its final rule.

But make no mistake. The EPA cannot fix the Renewable Fuel Standards. Congress must weigh in and repeal this broken program once and for all. We must repeal the mandate that diverts corn away from kitchen tables and into gas tanks. This mandate has not only increased food costs for American families but has increased food costs for the world's poor. This is why the Director General of the United Nations Food and Agricultural Organization called on EPA to suspend the RFS last year.

In addition, we must repeal the mandate for biofuels that are not commercially available. For years, we have heard that the RFS would result in large scale production of advanced biofuels, but this has not happened.

And I am sorry that we are limited because I wanted to quote Democratic Senator Chuck Schumer on his concerns about this as well.

So, with that I would like to put into the record my full statement, including the comments by Senator Schumer.

[The prepared statement of Senator Barrasso follows:]

STATEMENT OF HON. JOHN BARRASSO,
U.S. SENATOR FROM THE STATE OF WYOMING

Thank you, Madam Chairman. And thank you for holding this important hearing. In my view, it's long overdue.

The Renewable Fuel Standard or the RFS is among the most short-sighted energy policies that Congress has ever enacted.

The RFS has left a wake of economic and environmental harm that must be put to an end.

The RFS has increased food prices for American families.

The RFS has increased fuel prices for American motorists.

The RFS has contributed to a dirtier environment.

And—now—the RFS threatens to cause widespread damage to engines, fuel systems, and our transportation fuel infrastructure.

In June, I—along with Senators Pryor and Toomey—introduced S. 1195, the Renewable Fuel Standard Repeal Act. This bipartisan bill would repeal the RFS in its entirety. To date, 18 Senators have cosponsored the bill, including Senators Boozman, Crapo, and Inhofe—members of this Committee.

I'm also pleased that a diverse coalition of stakeholders supports this bill, including the National Cattlemen's Beef Association, the National Chicken Council, the National Turkey Federation, and the American Sheep Industry Association. I would also note that the editorial boards of USA Today, the Washington Post, and the Wall Street Journal have all called for the repeal of this mandate.

The debate over the RFS is not a debate between the oil industry and environmentalists. It's a debate between those who recognize the RFS is fundamentally broken and those who don't. Environmental organizations, such as the Environmental Working Group—which is represented here today—recognize the RFS is broken. Global hunger organizations, such as Oxfam and Action Aid, also recognize the RFS is broken.

Even EPA recognizes the status quo cannot continue. Last month, EPA took a small, but historic step. EPA proposed reducing the total volume of biofuels that suppliers must make available under the RFS. EPA has proposed this reduction to address issues surrounding the "blend wall." The "blend wall" is the amount of ethanol that can be safely added to the Nation's fuel supply. I applaud EPA for taking this step, and I encourage the agency to make further reductions in its final rule.

But make no mistake, EPA cannot fix the RFS. Congress must weigh in—and repeal this broken program once and for all. We must repeal the mandate that diverts corn away from kitchen tables and into gas tanks.

This mandate has not only increased food costs for American families, but has increased food costs for the world's poor. This is why the Director-General of the U.N. Food and Agricultural Organization called on EPA to suspend the RFS last year.

In addition, we must repeal the mandate for biofuels that are not commercially available. For years, we have heard that the RFS would result in large scale production of "advanced biofuels"—such as cellulosic ethanol. But this has not happened. It's absurd to fine businesses for failing to purchase a product that doesn't exist. Likewise, we should not require businesses to petition EPA—or the courts—for relief from this mandate year after year. We need sound energy policies—not artificial markets for fantasy fuels.

Madam Chairman, the gig is up. The RFS may have seemed like a good idea in 2005 or 2007. But it is nothing short of a colossal failure.

The senior Senator from New York predicted this would happen years ago. He stated that the RFS would "haunt every one of us," and "turn[ ] out to be a big disaster."

He compared the RFS to "a catastrophic illness . . . that should really have a skull and cross bones label on it."

He explained, "[t]here is no sound public policy reason for mandating the use of ethanol." And that "[o]ur citizens' health and environment are being held hostage to the desire of the ethanol lobby."

Madam Chairman, these aren't my words. These are the words of the senior Senator from New York.

Madam Chairman, it's time for this Committee to become relevant in this debate. It's time for this Committee to take up legislation to repeal the RFS. It's the right thing to do for American families, American motorists, and the environment.

I thank the witnesses for taking the time to be here today. I look forward to your remarks.

Senator BOXER. I think Senator Schumer will make his own voice heard very well on this matter.

Senator BARRASSO. Well, I welcome that opportunity.

[The referenced information follows:]

Reid	Snowe	Warner
Sarbanes	Specter	Wyden
Schumer	Sununu	

NOT VOTING—3

Corzine	DeWine	Feinstein

The motion was agreed to.

Mr. DOMENICI. I move to reconsider the vote.

Mr. NELSON of Nebraska. I move to lay that motion on the table.

The motion to lay on the table was agreed to.

The PRESIDING OFFICER. The Senator from New York.

AMENDMENT NO. 782 TO AMENDMENT NO. 779

Mr. SCHUMER. Mr. President, I rise to offer an amendment which is at the desk.

The PRESIDING OFFICER. The clerk will report.

The legislative clerk read as follows:

The Senator from New York [Mr. SCHUMER] proposes an amendment numbered 782 to amendment No. 779.

Mr. SCHUMER. Mr. President, I ask unanimous consent that reading of the amendment be dispensed with.

The PRESIDING OFFICER. Without objection, it is so ordered.

The amendment is as follows:

(Purpose: To strike the reliable fuels subtitle of the amendment)

Strike subtitle B of the amendment.

The PRESIDING OFFICER. The Senator from New York.

Mr. SCHUMER. Mr. President, I rise today in opposition to the amendment that has been put before the Senate by my good friend and colleague from New Mexico and offer a second-degree amendment to it. Now, I do so not only out of the sincere belief that the provision will hurt consumers in New York, but that it will hurt consumers throughout the country, and that it is anticompetitive and not the way a free market ought to go.

The amendment of my good friend from New Mexico is one of those amendments that, while well-intentioned, could come back to haunt every one of us. I have been in Congress for 23 years, and every so often there is an amendment that people vote for, confident on the surface that it seems like the right thing to do, and a few years later it turns out to be a big disaster. Then our constituents turn to us and say: What the heck have you done? How could you have done this?

This is one of those amendments, like a catastrophic illness. My colleagues, beware. If there was ever an amendment quietly put in a bill that should really have a skull and crossbones label on it, at least to those of us from States without a large amount of ethanol, this amendment is it.

So today I rise to join my colleague from New York, my colleagues from California and elsewhere, mainly on the coasts, but not exclusively so, to debate an unprecedented new ethanol gas tax that would be levied on the American people by the amendment we are now considering.

So many are against any kind of gas tax. I understand that. I have opposed many gas taxes, too. But why, when the gas tax comes in the form of an ethanol mandate but has the same effect—causes the price of gasoline to those under its yoke to rise—do we not oppose it?

The amendment offered by Senator DOMENICI does accomplish two goals that I consider very worthy and which my amendment would let stand. One is restricting the use of MTBEs, which has resulted in groundwater pollution all over the country. The second is scrapping the oxygenate mandate that led so many States to make such heavy use of MTBE in the first place.

The proposal in the amendment also provides an antibacksliding provision to require continued efforts on clean air. That is another goal that I support. The number of people who are living longer and living better because our air is cleaner is enormous. We all benefit from that. So the antibacksliding proposal is a good measure, and I applaud it.

I believe that eliminating the oxygenate requirement and letting each region meet clean air standards in the way that suits it best is smart energy policy. If that is all my friend from New Mexico did, I would be on the floor supporting his amendment and cheering it on.

But as they say, Mr. President, there is always a catch. This amendment adds an astonishing new anticonsumer, anti-free-market requirement that every refiner in the country, regardless of where they are located, and regardless of whether the State mandates it and whether the State chooses a different path to get to clean air, must use an ever-increasing volume of ethanol.

If they do not use the ethanol—and this is the most amazing part of the bill—they still have to pay for ethanol credits. If your State does not want to use ethanol because it is so expensive to transport it—there are no pipelines—on the barges and on the boats and in the trucks—so let's say it is too expensive to do that—you still have to pay for it.

If there were ever an onerous, anticompetitive, anti-free-market provision, this is it. Where else do we mandate that people pay for something when they do not use it? Why are we saying to the car drivers of America, the motorists of America, You have to pay for this stuff even though you do not use it? It is nothing less than an ethanol gas tax levied on every driver—the employee driving to work, the mom who is driving kids to school, a truck driver earning a living. Every gasoline user in this country will pay.

Now, in 2003, the United States consumed only 2.8 billion gallons of ethanol. Starting in 2006—a mere year away—they would be required to use 4 billion gallons of ethanol. Where are my friends from the free market when we need them? We hear about the free market. Is this a free market? Are we letting everyone decide how to meet a worthy clean air standard? Absolutely not. So 2.8 billion last year; in 2006, you have to use 4 billion; and by 2012, you have to use 8 billion gallons of ethanol and increase it every year by a percentage equivalent to the proportion of ethanol in the entire U.S. gas supply after 2012 in perpetuity.

If production does not happen, if we do not have enough ethanol—I don't know how the sponsors came up with 4 billion or 5 billion or 8 billion—guess what happens. We get a big price spike. At a time when gasoline is expensive enough, do you want to be accused of passing legislation that will raise the price more? I know there are corn growers in some States, and I know that Archer Daniels Midland and all these other ethanol producers are pretty powerful. But what about all the drivers and motorists throughout the country? What about them? There are many more of them than the rest, and every one of them will be at risk. Even in the Middle West where there is plenty of ethanol, if there is not enough to meet the mandate, there is going to be a price spike for everybody.

Now, there are a lot of estimates out there that try to predict what the new mandate is going to cost motorists at the pump. In some of the more conservative estimates, it is a few pennies a gallon. But others have pegged the cost significantly higher. Even though the size of the increase may be open to discussion, it is generally agreed that this mandate is going to cause an increase in the price of gasoline.

Last year when we had a bill, gasoline was about $1.60 or $1.70 a gallon. Now it is $2.25 a gallon. Do we still want to do this? Aren't gas prices high enough? The fact that we do not know how severe the increase is going to be should give us pause. As we have seen time and time again, there is not much more of an effective way to stifle an economy or place burdens on families across America than by causing a price spike, a hike in gasoline prices.

I know the supporters of this ethanol gas tax are going to argue that the claims I am making are not accurate, and the cost of forcing the entire country to use 8 billion gallons of ethanol is a mere pittance. Remember, ethanol is very hard to transport. It cannot be carried through our existing pipeline infrastructure. It must be put on a truck, a barge, sent down the Mississippi, then sent by boat all around the country, then loaded back into a truck, taken to a local refinery, and put into the gasoline. That will be the added expense passed on to the driver. That is why this is a regional proposal more than it is a party proposal.

To forecast how much a 6-year, 8-billion-gallon ethanol mandate is going to cost consumers across the country, you first have to look at the interplay of a host of complex factors—the growth in auto travel, gasoline prices, corn prices, ethanol prices, how many ethanol plants will come on line—and all of these are inextricably linked to how high the price of ethanol is going to go.

If ethanol prices are high and manufacturing ethanol profitable, the private sector will build ethanol plants. If ethanol prices are low, they will not. So I think the numbers my opponents are using make an unrealistic set of assumptions, basically that ethanol prices will be unusually low for the next 10 years, and yet at the same time the private sector will be building new plants all over the country. You can't have it both ways. If the price is high, yes, there will be more ethanol plants. If the price is low, there are not likely to be any, and the price is going to go up either way. But in truth, whether it costs a penny a gallon or a dollar a gallon, consumers should not be forced to pay an ethanol gas tax at all.

There is no sound public policy reason for mandating the use of ethanol, other than political might of the ethanol lobby. The new ethanol tax will contribute to market volatility and price spikes, especially because the ethanol industry is highly concentrated within a few large firms located in the Middle West. In fact, ADM alone controls almost 30 percent of the market, according to CRS.

My opponents also argue that the ethanol gas tax is needed to help family farms. I take these arguments seriously. I know how many of my colleagues from the Middle West want to help family farmers who are struggling. I want to help those farmers, too. I have stood by my Senate colleagues and voted for billions of dollars in agricultural subsidies to help the farmers in the South and West, even though those commodity subsidies don't help my farmers in New York. But as I have said, the ethanol gas tax money will not be going mostly into the pockets of family farmers, it will go into the pockets of ADM and the other big ethanol companies. All of a sudden, are the farmers going to get the big benefit? They don't get it for milk. They don't it for corn. They don't get it for meat. Is the beneficent rule of ADM going to give our corn growers the benefits of this or do you think ADM and the other big companies will take the benefit for themselves?

If you want to help our family farmers, take the money you are using that will cost this and give it to them, and you will spend a lot less money and help the family farmer a lot more without all the middlemen who don't need the help.

The final argument my opponents will make—and this is a cynical one—is that if New York and California and other States want to clean up their water by banning MTBEs and maintaining clean air, they should have to pay the price of an ethanol gas tax, and it is political naivete to think otherwise. My State has already banned MTBE. So have others, such as California, Colorado, Connecticut, Indiana, Illinois, Iowa, Kansas, Kentucky, Maine, Michigan, Minnesota, Missouri, Nebraska, Ohio, South Dakota, and Washington. Every one of these States has enacted its own MTBE bans or taken steps to restrict its use. A number of other States are in the process of taking action as well. Because what we have learned is that MTBEs pollute the ground water.

Every one of those States that has banned MTBE is going to find itself in an impossible dilemma. Their citizens are demanding they ban MTBE, but with the oxygenate requirement in place, they can't do so. Recently, the EPA denied the application of New York and California for a waiver from the oxygenate requirement, putting States with MTBE bans between a rock and a hard place. Our citizens' health and the environment are being held hostage to the desire of the ethanol lobby to make ever larger profits. Why didn't the EPA grant the waiver? It didn't affect clean air or clean water. Raw politics, trying to suck money out of one region and put it in another. That is not fair. That is not right.

Our citizens' health and environment are being held hostage to the desire of the ethanol lobby to make ever larger profits. The administration has already gone along. Will this Senate?

It is an outrage. For Congress to tell Americans across the country that we refuse to clean up the air and water unless they pay off ADM is unconscionable. There is no public policy reason on Earth not to allow States to ban MTBEs and remove the oxygenate requirement and keep clean air standards in place without requiring them to buy ethanol.

In New York, we have been forced to for over a year and a half. Our gasoline prices are too high already, and the unnecessary ethanol requirement we face is not helping.

In conclusion, I ask my colleagues to support my amendment to strike the ethanol mandate. If you believe that Congress has the obligation to protect the health of our citizens and the environment, support banning MTBE, getting rid of the oxygenate requirement, and maintaining clean air standards. Don't support forcing American consumers to pay for ethanol in exchange. If you believe the Congress has an obligation to protect consumers and keep our free market running as efficiently as possible, then, again, I ask Members, please, do not support forcing American consumers to raise their gas prices and to pay for ethanol.

The PRESIDING OFFICER. The Senator from New Mexico.

Mr. HARKIN. Will my friend yield for a question?

Mr. SCHUMER. I am happy to yield for a brief question to my good friend from Iowa.

Mr. HARKIN. Since my friend mentioned——

Mr. DOMENICI. I believe I have the floor. I am pleased to yield.

Mr. HARKIN. I thought he still had the floor.

Mr. SCHUMER. I didn't think I had yet yielded the floor.

The PRESIDING OFFICER. The Senator from New York still has the floor.

Mr. SCHUMER. I was about to, but I am finished with my statement.

Mr. HARKIN. I just wanted to respond to my friend from New York. Is my friend from New York aware of the fact that right now, the price of gasoline is around $2.03, or $2.05 a gallon? Ethanol right now is about $1.60 a gallon. My question to my friend from New York is, if the free market is at work, why aren't the oil companies blending more ethanol since they would make more money?

Mr. SCHUMER. Well, let me answer my friend. The cost of ethanol varies greatly depending on what region of the country the ethanol is produced in. What makes it so expensive for New Yorkers is not the cost of actually making it in Iowa or Illinois or Kansas. What makes it so expensive is there is no cheap way to get it from the cornfields of Iowa to the gas stations of New York and, as a result, the cost of transporting the ethanol. Sure, it can be made out there. We don't have many ethanol plants in New York. They have to put on it barges. They have to ship it slowly down the Mississippi. They have to unload it onto boats. The boats have to go round the gulf coast, go around Key West, up the east coast. They have to dock in New York City. It then has to be loaded onto trucks and sent to gas stations—a lengthy and expensive process.

Let me say in all seriousness to my good friend from Iowa, I have talked to some of the major refiners in the Northeast. They are able to meet the clean air standard more cheaply and better without ethanol than with it. And by our requiring them to put the ethanol in the gasoline is the only reason they do it. If we didn't require them but kept the clean air standard, we would have gasoline that is just as clean but a lot cheaper for constituents.

I want to help your corn farmers, but I don't want the housewife who drives the kids to school or the salesman who has to go door to door to be subsidizing your corn farmers. Let the whole government do it.

Mr. HARKIN. Will the Senator yield for another question?

Mr. SCHUMER. I am happy to yield for another question.

Mr. HARKIN. My friend talked about the transporting of ethanol going down the Mississippi and then on barge around this and that. Has my friend ever considered how you get the oil from the Mideast over here? You have to go over there with a big tanker. You have to load it up. Then that tanker has to go across the oceans, and it has to come into New York or wherever the port is and unload it. Then it has to be shipped to a refinery to refine it.

Then, in order to protect that oil pipeline from the Mideast, we have to send 130,000 troops, our military. We have to protect our sea lanes—the billions of dollars that it costs to protect

shipping that oil from the Mideast and all that. I can assure my friend from New York that they will never have to send our young men and women to Iowa to fight.

Mr. SCHUMER. We would like to send them to Iowa on vacation to help pick the corn, but, certainly, we hope that this ethanol fight, as fractious as it is—I can state that the citizens of New York will not declare war on the citizens of Iowa.

Mr. HARKIN. You will never have to worry about that.

Mr. SCHUMER. Although the bill declares economic war on the citizens of New York, Connecticut, California, and other places which don't have the ethanol.

By the way, I say to my good friend from Iowa, I would not make the analogy that what the ethanol producers are doing is the same as what OPEC is doing with the oil, both causing the price to go way up. I don't like the big oil companies in terms of what they do, but I don't think Archer Daniels Midland is much better.

Mr. HARKIN. We have 16 ethanol sites in Iowa; 11 are predominantly owned by farmers. There is one that Cargill owns, and ADM owns one. Almost all of the new ethanol plants being built in the United States are owned and operated by farmer-owned enterprises. It so happens that ADM was there in the beginning.

But what is happening now—and especially with this legislation—is you are going to see more and more farmer-owned plants. That is what is happening. My friend is talking about the past. We are talking about the future.

The way to break the OPEC cartel is to get a lot of farmers around the country, using new technologies, making ethanol out of corn and cornstalks, and a variety of other feedstocks—and we will soon be making ethanol in the State of New York, as well as in New England. That is what this is about. It breaks the back of the OPEC cartel.

Mr. SCHUMER. I say to my friend, I would like nothing better than to break the cartel. Some say one of the ways to break the cartel is to put a tax on gasoline. The higher you tax the gasoline, the less you will need OPEC. That is true. But the reason we reject that high tax on gasoline is the burden it puts on average people. Well, if that burden is placed on the average driver in New York to pay a lot more to the ethanol producers rather than OPEC, what have we gained? Fifty cents out of your pocket? If faced with a choice, I would rather have it go to an American company—although there is ExxonMobil and others—I would rather it go to an American producer in the cornfields in Iowa than to the oilfields in Saudi Arabia. But neither is a very good choice. Both of them cause huge hardship on the consumer by raising the price.

So all I say to my friend from Iowa, who I know has the interests of the average worker at heart—all I say to him is, if ethanol is better than gasoline and cheaper for people in Iowa or Illinois, God bless you, use it.

Let me ask my friend a question. Is it fair—because we won't use the ethanol in a lot of instances—to say to us, as this amendment does, you have to pay for it whether you use it or not?

Mr. HARKIN. I respond that that is not the case. I will say more about that in my remarks following my friend. That is not the case at all. I wanted to correct something. I made a mistake. In all good faith, and in making sure that I speak correctly, I said earlier that a gallon of gasoline was $2.03 and ethanol was $1.60. What is it in New York?

Mr. SCHUMER. It is $2.25.

Mr. HARKIN. I was wrong about ethanol. A gallon of ethanol is only about $1.22. I point out that it would be great if more people used it. It is only $1.22 and $2.25 for gasoline.

Mr. SCHUMER. If my colleague can get the price of whatever it takes to drive a car down to $1.22 in New York and have the same efficiency—it is almost as efficient, not quite, at 90 percent—and the same level of cleanliness in the air, I would be all for it. But everyone knows, again, whether it is $1.20 or $1.60, the basic cost for us is the transportation cost.

My colleague from New Mexico has been waiting very patiently. I appreciate the spirit of my good friend from Iowa in this dialog, which we have disagreed on over the years. I don't know if we will ever agree on it.

I am happy to yield the floor so my colleague from New Mexico can make his comments.

The PRESIDING OFFICER. The Senator from New Mexico is recognized.

Mr. DOMENICI. Mr. President, I say to my friend from New York, maybe on this one we disagree, but we have another big issue that we agree on. We are going to do something about the art community in your State and collectible items.

Mr. SCHUMER. Maybe under the chairman's leadership—if the chairman will yield—we should add that wonderful amendment to this bill and pass it right now.

Mr. DOMENICI. I don't know what would happen if we went to the House with it. Maybe we could hurry it up that way. In any event, a number of Senators want to speak. I will not address the issue that was spoken to because many others are going to—except I remind everybody that something was said here about a monopoly, lack of competition. The Senator from New York made the case for lack of competition. When we use gasoline, let's not forget we have been subjected to the most monopolistic control mechanism for the price of almost anything this country has ever seen. The cartel is strangling us.

As we drive down the road, we are driving on gasoline that is indeed noncompetitive. It is competitive for a few cents because the filling stations might be competitive, but the basic price is the monopolistic issue.

Mr. REID. Mr. President, I rise to discuss the energy bill that we will consider over the next 2 weeks. Senators DOMENICI and BINGAMAN should be commended for their bipartisan work in the Energy and Natural Resources Committee to bring us to this point today.

The events over the last 4 years have highlighted what Americans have known since the 1970s—our national security and our economic security depend on our energy security. Americans need and deserve an energy bill that truly moves us toward energy independence.

Seriously addressing our national security means kicking our dependence on foreign oil.

Today, we import 58 percent of our oil.

Our dependence on imported oil poses a risk to our national security and our economic well-being.

We will consider a number of additional proposals that can help make greater energy security a reality for future generations of Americans.

There will be amendments offered to the bill regarding energy security, renewable energy, biofuels, climate change, and fuel economy.

We must reduce our dependence on foreign oil and make a commitment to clean, renewable energy.

If we choose to invest in energy efficient technologies and renewable energy, we will create thousands of new jobs . . . we will protect our environment . . . and we will bolster our national security.

That is the vision our Nation needs. That is the leadership we must provide.

Mr. CORZINE. Mr. President, I first thank Chairman DOMENICI and the ranking member, Senator BINGAMAN, as well as both of their staffs on the Energy Committee for all of their hard work in preparing an energy bill. Their leadership has allowed the Senate to come together today and discuss an issue that is paramount to our Nation's quality of life and our homeland and economic security.

As this body considers omnibus energy legislation, it is crucial that we formulate an energy bill that meets several criteria. The legislation must reduce the United States' unhealthy dependence on foreign oil; address the United States' skyrocketing gas prices; invest in environmentally friendly technology and research; protect the moratorium on drilling in the Outer Continental Shelf; address global warming; and promote energy efficiency.

The Department of Energy currently projects that coal and natural gas will be used to meet most of our Nation's increasing electricity energy demand over the next 20 years. It is my firm belief, however, that as we increase generation, the United States must ensure that its energy portfolio is well diversified. New Jersey, which is already suffering from the effects of poor air quality—one-third of which is traced to

Senator BOXER. With you. With you. OK.

We are going to turn to Senator Merkley now.

Senator MERKLEY. Madam Chair, I am happy to get right to our testimony.

Thank you.

Senator BOXER. Thank you very much.

We will turn to Senator Fischer.

OPENING STATEMENT OF HON. DEB FISCHER, U.S. SENATOR FROM THE STATE OF NEBRASKA

Senator FISCHER. Thank you, Madam Chairman.

I was pleasantly surprised to find out that a Nebraska farmer, Jon Holzfaster, would be among today's witnesses. I appreciate Jon's willingness to come to Washington to share his views and would like to offer him a warm welcome.

Nebraskans certainly understand the importance of the Renewable Fuel Standard. Our State has answered the call to invest in domestic renewable fuel production. Nebraska has 24 active ethanol plants and an annual production of 2.3 billion gallons. These plants represent more than $5 billion in capital investment in the State and provide direct employment for approximately 1,200 Nebraskans.

On a national scale, the RFS is working to enhance domestic energy supplies and reduce our dependence on foreign oil. Adding more than 13 billion gallons of domestic ethanol to the U.S. fuel supply in 2012 displaced the need for 465 million barrels of foreign oil at a savings of $47.2 billion to the U.S. economy. This is roughly the equivalent of 12 percent of total U.S. crude oil imports. The RFS also helps to support more than 380,000 American jobs and lower fuel prices for consumers.

During the short time that the RFS has been in place, we have only become more efficient both at production of the biofuels themselves but also of the feedstocks for these fuels. Coming from the Cornhusker State, I am especially proud of our farmers' ability to continually produce more while using less land, less water and less fertilizer. Through careful stewardship of our natural resources and the adoption of innovative technologies, our farmers are able to produce an abundant supply of food, feed and fuel in an environmentally sustainable manner.

At such a time of this innovation and growth potential for the biofuels industry, it is concerning that EPA is now proposing a significant rollback in the RFS. EPA's proposal essentially waives RFS requirements beyond a 10 percent blend of ethanol, eliminating the incentives to invest in the infrastructure necessary to bring higher blends to the marketplace and meet the goal of future biofuels growth.

With that, I would like to have the rest of my comments put in the record, Madam Chair.

Thank you.

[The prepared statement of Senator Fischer follows:]

STATEMENT OF HON. DEB FISCHER,
U.S. SENATOR FROM THE STATE OF NEBRASKA

Chairman Boxer and Ranking Member Vitter, thank you for holding today's oversight hearing on domestic renewable fuels. I am pleased that the Committee is tak-

ing time to review our Nation's biofuels policy and to scrutinize recent administrative action with respect to the Renewable Fuel Standard.

I am glad that we will be hearing from witnesses who can share the perspective of many across our Nation who have made significant investments with the RFS in mind. I was pleasantly surprised to find out that a Nebraska farmer, Jon Holzfaster, would be among today's witnesses. I appreciate Jon's willingness to come to Washington to share his views and would like to offer him a warm welcome.

Nebraskans certainly understand the importance of the Renewable Fuel Standard. Our State has answered the call to invest in domestic renewable fuel production. Nebraska has 24 active ethanol plants and an annual production capacity of 2.3 billion gallons. These plants represent more than $5 billion in capital investment in the State and provide direct employment for approximately 1,200 Nebraskans.

On a national scale, the RFS is working to enhance domestic energy supplies and reduce our dependence on foreign oil. Adding more than 13 billion gallons of domestic ethanol to the U.S. fuel supply in 2012 displaced the need for 465 million barrels of foreign oil, at a savings of $47.2 billion to the U.S. economy. This is roughly the equivalent of 12 percent of total U.S. crude oil imports. The RFS also helps to support more than 380,000 American jobs and lower fuel prices for consumers.

During the short time that the RFS has been in place, we have only become more efficient—both at production of the biofuels themselves, but also of the feedstocks for these fuels. Coming from the Cornhusker State, I am especially proud of our farmers' ability to continually produce more while using less land, less water, and less fertilizer. Through careful stewardship of our natural resources and the adoption of innovative technologies, our farmers are able to produce an abundant supply of food, feed, and fuel in an environmentally sustainable manner.

At a time of such innovation and growth potential for the biofuels industry, it is concerning that EPA is now proposing a significant rollback in the RFS. EPA's proposal essentially waives RFS requirements beyond a 10 percent blend of ethanol, eliminating the incentives to invest in the infrastructure necessary to bring higher blends to the marketplace and meet the goal of future biofuels growth.

Lowering renewable fuel targets will jeopardize years of progress in the biofuels industry. I appreciate that EPA took the time to hear from so many stakeholders at its listening session on the RFS last week. I am hopeful that EPA will give careful consideration to the comments it receives and the economic impacts of its proposal.

There is much at stake for America's energy future. Ensuring the successful operation of the Renewable Fuel Standard is an important part of realizing greater domestic energy security. I look forward to today's discussion. Thank you.

Senator BOXER. Without objection. Thank you.

Senator Inhofe.

OPENING STATEMENT OF HON. JAMES M. INHOFE, U.S. SENATOR FROM THE STATE OF OKLAHOMA

Senator INHOFE. Yes, I agree with the comments that this is overdue. We had a hearing on this 2008. The one before that was 2006 and that was when I chaired this Committee. And it is overdue.

We can all remember the RFS was expanding back in 2007 and one of the main arguments was to improve our national security. I know that General Wes Clark is going to be on the next panel, and he has been on the dime at the ethanol industry now for several years. He has repeatedly accused the U.S. Government of fighting wars simply for foreign sources of oil, and in one of his interviews he quipped, put quite simply, that is what people fight wars about.

Last Saturday was December 7th, and every year we remember the attack on Pearl Harbor. And for good reason. That is what drew us into World War II. Americans fight wars to protect their fellow Americans from evil harms. Period. That would mean that energy security and national security are disconnected. But if want

to have a conversation about that, we should look no further than the domestic oil and gas industry.

Since 2008, the energy market has been turned upside down. The combination of precision drilling and hydraulic fracturing has opened up the Shale Revolution that no one saw coming. In 2007, oil production was down and we were in the middle of building massive terminals to import liquefied natural gas. Since then, oil production is up over 50 percent and we have so much natural gas that we are converting the import terminals into export terminals.

And the news just keeps getting brighter. In October, the EIA published a report stating that the U.S. will overtake Russia this year as the largest oil and natural gas producer in the world. In November, the EIA reported that by 2035, we will be able to meet all of our energy requirements from domestic sources. I would say that it would be even sooner than that, quite a few years sooner than that, if we would start developing our resources on national land. General Clark should know quite a bit about this because he also is the Director of BNK Petroleum which is an oil and gas operation all over the world, including my State of Oklahoma.

Last month, the EPA announced the 2014 volume requirements for the RFS mandate and for the first time ever the agency lowered the mandate levels across the board and, in doing so, the EPA has admitted the mandate is completely broken. I think we talked about that. No one believes that it is running right. I have been highlighting the mandate's problem for a long time, and it is clear that the chorus of agreement is growing louder every day.

Oklahomans of all stripes understand that the RFS is a bad deal and our drivers are particularly aware. Before I run out of time, put that chart up. All throughout Oklahoma, this is the marketing. If you can sell no ethanol and it is clear gas, they buy it.

So, I have got a lot more to say here in this statement but let us roll with letting the market determine what we are doing. That is what I would hope this would come to.

Senator BOXER. Well, we will put this in the record. And I hope people can refrain from attacking people.

Senator INHOFE. I am not attacking anyone.

Senator BOXER. If I might conclude? I would like people to refrain from personal attacks on people who believe that what they are doing is good for their country. There is just a disagreement. I do not think we need to attack each other. So, that is just an opinion.

Senator INHOFE. And I agree.

[The referenced statement was not received at time of print.]

Senator BOXER. Thank you very much.

And also for the record, let the record show that we had a hearing on this particular subject on April 13, 2011, where Secretary Vilsack was our main person who was the witness at that particular time.

And we will move forward now to Senator Crapo.

Senator CRAPO. Thank you, Madam Chairman. I will help to move this along and waive my opening statement.

Senator BOXER. Thank you, Senator.

Senator Wicker.

OPENING STATEMENT OF HON. ROGER WICKER, U.S. SENATOR FROM THE STATE OF MISSISSIPPI

Senator WICKER. I believe Senator Crapo just yielded his 3 minutes to me, and I certainly appreciate that.

[Laughter.]

Senator WICKER. Thank you, Madam Chair, and Ranking Member Vitter. I look forward to the witnesses' testimony on some of the significant problems many industries face because of the Renewable Fuel Standards. The sheer number of the parties concerned about the impacts of this legislation is a testament to the fact that this Committee and Congress should act to correct some of the consequences of renewable mandates.

It says a lot that EPA recently was forced to lower the overall renewable volumes for 2014. Clearly the assumptions made in 2007 regarding gas consumption have proven inaccurate. The mandates based on those assumptions are not feasible and should be modified.

Allowing EPA flexibility to adjust RFS each year leads to one of the greatest problems with Government interference in the marketplace, uncertainty in the very industries that actually produce our country's advanced technologies and products. These industries must be able to continue to move our country forward and create jobs needed to strengthen our economy.

I agree with Senator Cardin about the effect fluctuating corn prices have had in recent years. High demand for corn ethanol caused by the RFS has led to higher costs for livestock and poultry producers, an unintended and adverse consequence of this program. This directly causes American families to face higher bills at the grocery store and in restaurants. America's energy policy should promote efficiency and value. It should not hurt consumers or cause them to bear unnecessary costs. It is clear that the RFS falls short of this fundamental principle of U.S. lawmaking.

In addition, regulatory action by the Administration disregards the facts and is shortsighted. In an ill-advised stop-gap rule, EPA has on several occasions waived the 10 percent limit of ethanol that can be blended into gasoline. Studies conclude that gasoline with 15 percent ethanol, or E15, can cause premature engine damage and reduce fuel efficiency. These detrimental effects can force drivers to endure added maintenance costs and refuel more frequently.

Last year, AAA raised these concerns when urging the Obama administration and gasoline retailers to stop the sale of E15. In addition, a number of auto manufacturers have already said that E15 does not meet their fuel requirements and that warranty coverage would not apply to vehicle damage resulting from gasoline with the higher blend of ethanol.

In February, I introduced legislation to prohibit EPA from allowing gasoline blends with E15 to be used in passenger cars and trucks. And finally, Madam Chair, I believe my legislation should be included in the necessary reforms of RFS. This legislation would protect consumers and not allow the Administration to make fictional fixes to ethanol mandates that are clearly not good for the public nor solve the actual problem.

Thank you.

Senator BOXER. Thank you, Senator. We are going to—Senator Whitehouse has graciously said Senator Carper could go first because he is chairing a very important proceeding. Please proceed.

OPENING STATEMENT OF HON. THOMAS R. CARPER, U.S. SENATOR FROM THE STATE OF DELAWARE

Senator CARPER. Thank you so much. Sheldon, thank you, and to our witnesses. Thank you, Madam Chair, for giving me a chance to say a few words. We are having a business meeting of the Homeland Security and Government Affairs Committee to vote the nomination of the President's nominee to be Deputy Secretary of Homeland Security. And it starts in about 6 or 7 minutes. So, thank you very much.

First of all to our witnesses, thank you for joining us. Panel No. 1, panel No. 2, especially Jim Collins who is out there somewhere, I think, one of my constituents from Delaware who does great work on BAF at DuPont Company and really for all of us. So, thank you, Jim.

In 2007, our Nation's energy future was not as bright as it is today. Consumption of gasoline and diesel was expected to grow exponentially, and feeding this growth was oil from other nations many of which, frankly, did not like us a whole lot and still do not. That is why in 2007 Congress took a number of steps, along with the Bush administration, to try to change our energy future.

For example, Congress increased the Fuel Efficiency Standard for cars, trucks and vans for the first time in 32 years. As someone who worked very closely with Senators like Ted Stevens, Dianne Feinstein, Dick Durbin and others to help us find an agreement, I am very proud of this achievement. I know that our efforts laid the groundwork for future efficiency increases by the current Administration.

In 2007, Congress also mandated a Clean Air Act by more than doubling the domestic biofuel mandate to 36 billion gallons by 2022. We included new incentives for advanced fuels that were better for the environment and that were not derived from the food we eat or from the food that our chicken and our cattle eat, too.

Since 2007, we have seen a change in the energy trend lines and our energy future looks a whole lot better than it has in decades. Today, for the first time in two decades, we are producing more oil than we are importing. I did not think I would be serving in the Senate when we could say that, but I am pleased to say that we are. That is because production at home has increased, consumption has gone down and biofuel use has increased replacing oil-based fuels.

And finally today we are seeing the first commercial-scale advanced biofuel facilities that are being built providing an alternative to traditional corn ethanol.

To keep us on the path toward a brighter, greener energy future, I believe it is important for this country to continue to invest in biofuels, especially in advanced biofuels. I believe the Renewable Fuel Standard is a crucial policy tool to keep these investment flowing.

Biofuels done right are crucial to our energy security but we cannot ignore the unintended consequences of increasing our biofuel

mandates. Supporting investments in the next generation of renewable fuels while still protecting our environment and economy is no small feat. But it can be achieved. I look forward to today's discussion once I return to see how we can strike that balance.

On that note, I want to thank again our witnesses and thank you, Madam Chair, for giving me this opportunity. And I will be back a little bit later.

[The prepared statement of Senator Carper follows:]

STATEMENT OF HON. THOMAS R. CARPER,
U.S. SENATOR FROM THE STATE OF DELAWARE

In 2007, our Nation's energy future did not look good. Consumption of gasoline and diesel was expected to grow exponentially, and feeding this growth was oil from other nations—many of which didn't like us very much.

That's why in 2007, Congress took several steps to try to change our energy future. For example, Congress increased the fuel efficiency standards for cars, trucks and vans for the first time in 32 years. As someone who worked very hard with Senators Feinstein and Stevens to help us find an agreement, I am very proud of this achievement. I know our efforts laid the groundwork for future efficiency increases by the Administration.

In 2007, Congress also amended the Clean Air Act by more than doubling the domestic biofuel mandate to 36 billion gallons by 2022. We included new incentives for advanced fuels that were better for the environment and were not derived from the food we eat or the food our chickens and cattle eat. Since 2007, we have seen a change in the energy trend lines—and our energy future looks better than it has in decades.

Today, for the first time in two decades we are producing more oil than we are importing. That's because production at home has increased, consumption has gone down and biofuel use has increased—replacing oil-based fuels. And finally today, we are seeing the first commercial scale advanced biofuel facilities being built—providing an alternative to traditional corn ethanol.

To keep us on the path toward a brighter, greener energy future, I believe it is important for this country to continue to invest in biofuels—especially in advanced biofuels. I believe the Renewable Fuel Standard is a crucial policy tool to keep these investments flowing. Biofuels done right are crucial to our energy security, but we cannot ignore the unintended consequences of increasing our biofuel mandates.

Supporting investments in the next generation of renewable fuels, while still protecting our environment and economy is no small feat, but it can be achieved. I look forward to today's discussion to see how we can strike that balance.

And on that note, I look forward to having an open and thoughtful dialog with our witnesses and colleagues today.

Senator BOXER. Senator, thank you so much.

And finally, Senator Whitehouse.

OPENING STATEMENT OF HON. SHELDON WHITEHOUSE, U.S. SENATOR FROM THE STATE OF RHODE ISLAND

Senator WHITEHOUSE. Thank you, Madam Chair.

Rhode Island has some exciting companies that operate in this space. We have Newport Biodiesel, which takes basically restaurant waste and turns it into useable fuel. We have BioProcess Algae which is running a plant right now in Shenandoah, Iowa and it grows algae off of the carbon waste of an ethanol plant and it can turn either into more fuel for ethanol manufacture or, if the algae is right, you can grow lipid rich algae that can actually be pressed out for oil that can be turned into fuel. So, there is great opportunity here in very exciting technologies, and I look forward to the hearing.

I am glad that we stuck with the E10. I join with Senator Roger Wicker in supporting that. Rhode Island has a marine economy and the marine engines simply do not operate well at higher levels of

ethanol, and when you are out in the ocean that is no time to be messing around with your engine. So, I thank the EPA on their responsiveness on that.

I do think we need to reconsider the value of ethanol, particularly ethanol produced in coal-fired facilities as a carbon value as opposed to adding to our carbon hazard. And I am looking forward to discussing the diesel standards which seem improbably low and I look forward to an explanation as to how EPA got there.

So, thank you for holding the hearing. This is an area where I think technology is going to open up vast new markets and opportunities and we need to make sure we are setting the rules in a way that supports those emerging technologies.

Thanks.

Senator BOXER. Thank you very much, Senator.

Senator Sessions, we are glad you joined us.

OPENING STATEMENT OF HON. JEFF SESSIONS, U.S. SENATOR FROM THE STATE OF ALABAMA

Senator SESSIONS. Good morning.

I believe that we do need to evaluate where we are with ethanol. I have supported that in the past and was very confident about cellulosic research and development possibilities. Things like algae and other products of that kind I thought were going to be coming on line sooner than they have. In fact, we had some prospects in Alabama I was very excited about, talked to President Bush about. But they were not accurate, they did not produce and it is not workable.

Those numbers, actually, from that process were utilized by energy, I guess, or EPA energy, to estimate what we could receive from cellulosic ethanol. Cellulosic has an advantage because it does not utilize the kind of crop land that corn-based ethanol does. AP has had a very thorough article within the last few weeks in which it raises fundamental questions about the environmental benefits of corn-based ethanol.

You just have to look at that. You break up land. I know where I grew up in Alabama land that was in timber is now being returned to farmland because of prices and, I assume, ultimately driven by some of the ethanol requirements.

So, I think it is time for us to review these regulations. I support backing off the higher numbers and I wonder really whether we can sustain the mandates that we have and maybe we should look to phase those out and the subsidies in the time to come. That might be the best thing environmentally, it might be the best thing economically.

Madam Chairman, this is an important issue. Thank you for having the hearing and I look forward to really learning more because I do not pretend to know all the answers.

Senator BOXER. Senator, thank you. That is a unique comment for a Senator to make.

[Laugher.]

Senator BOXER. It is very refreshing, to tell you the truth.

We are going to now get started. We are going to end this panel at 10:15 a.m., so we will go as far as we can go with the questions. I hope colleagues will understand. If you do not get your question

answered, you will go first in asking a question to the next panel because we will have to stop at 11 a.m.

So, we are going to get started with our panel No. 1, Mr. Chris Grundler, Director, Office of Transportation and Air Quality, United States EPA, and Mr. Steven Chalk, Deputy Assistant Secretary for Renewable Power, Office of Energy Efficiency and Renewable Energy, United States Department of Energy.

So, welcome, Mr. Grundler.

STATEMENT OF CHRISTOPHER GRUNDLER, DIRECTOR, OFFICE OF TRANSPORTATION AND AIR QUALITY, OFFICE OF AIR AND RADIATION, U.S. ENVIRONMENTAL PROTECTION AGENCY

Mr. GRUNDLER. Thank you very much, Chairman Boxer, Ranking Member Vitter and other members of the Committee. I appreciate the opportunity to testify today on the Renewable Fuel Standard Program.

The RFS Program began in 2006, as has been mentioned, under the Energy Policy Act of 2005. The program's requirements were then modified by the Energy Independence and Security Act of 2007. EISA established new volume standards for renewable fuel, reaching a total of 36 billion gallons by 2022, including 21 billion gallons of advanced biofuels.

The revised requirements also included a number of new provisions including greenhouse gas emissions thresholds. After an extensive notice and comment process, EPA finalized regulations to implement the EISA requirements. Those regulations went into effect in July 2010, and we have since been focused on implementing the program.

EISA requires EPA to publish annual standards for four different categories of renewable fuels: total, advanced, biomass-based diesel and cellulosic. These standards apply to obligated parties which are typically refiners and fuel importers.

On November 29 of this year, EPA published in the Federal Register a Notice of Proposed Rulemaking that would establish the annual RFS volume requirements for 2014. For reasons explained in detail in the notice, EPA is proposing to use authorities granted under the Clean Air Act to adjust the required total and advanced volumes for 2014 below the targets laid out in the statute.

Our proposed rulemaking includes a detailed discussion of what is known as the ethanol blend wall. In the years between when Congress created the RFS Program and today, production and use of renewable fuels has grown rapidly. At the same time, however, fuel economy improvements and other factors have resulted in lower gasoline consumption than what was projected at that time. As a result, obligated parties are now facing the E10 blend wall where the country's gasoline fuel pool is saturated with ethanol at the 10 percent level a few years earlier than initially projected.

If gasoline demand continues to decline, as is currently forecasted, increasing the amount of ethanol used in the fuel pool will require greater use of gasoline blends with higher ethanol contents. Examples of such blends are E15 and E85. There are limitations in the market, however, to the increased use of these higher blends

including limits on fueling infrastructure and the number of vehicles that can operate on such fuel blends.

In light of these factors, EPA is using authorities granted under the law to propose adjustments to the RFS statutory 2014 volume requirements. Our objective in doing so is to balance the broader goals of the program, including the long-term growth in renewable fuels, against these constraints that exist in the market and fuel system today.

Our approach applies two different authorities in the law that permit EPA to reduce volumes of advanced biofuel and total renewable fuel below the statutory volumes. When the Administrator lowers the required volume of cellulosic biofuel below the target, EPA also has the authority to reduce the volumes of advanced biofuel and total fuel by the same or a lesser amount. The Administrator can also reduce the required volumes of renewable fuel under the general waiver authority under certain conditions, including if the Administrator makes a determination of inadequate domestic supply.

Our 2014 proposal uses a combination of these two authorities to reduce volumes of both advanced biofuel and total renewable fuel. The proposed volumes for 2014 are as follows. For cellulosic biofuel, 17 million gallons, biomass-based diesel, 1.28 billion, advanced biofuel, 2.2 billion gallons, and total renewable fuel, 15.21 billion gallons.

The proposal also includes volume ranges for each biofuel category. Including these ranges reflects our recognition of the inherent uncertainty in developing projects for biofuel use as well as provide stakeholders the ability to comment and provide data on a range of volumes and any other factors that should inform these ranges.

The 2014 proposal includes a lengthy discussion and analysis about the proposed adjustments to these categories and seeks public comment on several alternative approaches to setting the total and advanced fuel standards. We think that our proposed framework for determining appropriate volumes of total renewable fuel and advanced biofuel would simultaneously address the ethanol blend wall as well as the limitations in availability of qualifying renewable fuels. Our intent is that the approach would allow for long-term growth in renewable fuels while recognizing current constraints in the marketplace.

The proposed rulemaking is now open for public comment. The comment period runs for 60 days from publication which ends January 28, 2014.

Just last week we held a public hearing on the proposal where we heard testimony from over 130 stakeholders demonstrating the high amount of interest in this policy and the diversity of fuels.

I see my time is up, so I am glad to be here and I look forward to your questions.

[The prepared statement of Mr. Grundler follows:]

Christopher Grundler

Director

Office of Transportation and Air Quality

Office of Air and Radiation

U.S. Environmental Protection Agency

Committee on Environment and Public Works

U.S. Senate

December 11, 2013

Written Statement

Chairman Boxer, Ranking Member Vitter and other members of the Committee, I appreciate the opportunity to testify on the subject of the Renewable Fuel Standard program, which lays a foundation for reducing greenhouse gas emissions and reducing America's dependence on imported oil by growing our nation's renewable fuels sector.

Overview of the Renewable Fuel Standard Program

The Renewable Fuel Standard (RFS) program began in 2006 pursuant to the requirements in Clean Air Act (CAA) section 211(o) which were amended by the Energy Policy Act of 2005 (EPAct). The statutory requirements for the RFS program were subsequently

modified through the Energy Independence and Security Act of 2007 (EISA). These provisions established new year-by-year volume standards for renewable fuel that generally must be used in transportation fuel, reaching a total of 36 billion gallons by 2022. This total includes 21 billion gallons of advanced biofuels, comprising 16 billion gallons of cellulosic biofuel, and at least 1 billion gallons of biomass-based diesel, with the remainder consisting of "other" advanced biofuels. The revised statutory requirements also included new definitions and criteria for both renewable fuels and the feedstocks used to produce them, including greenhouse gas (GHG) emission thresholds. Advanced and cellulosic biofuel must achieve at least a 50 and 60 percent reduction, respectively, in lifecycle greenhouse gases compared to the 2005 baseline average gasoline or diesel fuel that it replaces.

On March 26, 2010, in response to EISA, EPA promulgated regulations to implement these revisions to the national Renewable Fuel Standard program. These regulations were developed in collaboration with refiners, renewable fuel producers, and many other stakeholders. In developing the regulations, EPA applied the best available science, conducted peer reviews on new analytical methodologies, and carried out extensive analyses to implement EISA's complex and challenging statutory provisions. The regulatory requirements went into effect on July 1, 2010, and apply to domestic and foreign production of renewable fuels used in the United States. EISA requires that each year EPA publish the annual standards for use of total, advanced, biomass-based diesel, and cellulosic renewable fuels that apply to obligated parties, which are typically refiners and importers of gasoline and diesel.

Proposed Required Volumes for 2014

On November 29, EPA published in the Federal Register[1] a notice of proposed rulemaking that would establish the annual RFS volume requirements for 2014. In this action, EPA proposed to set the required cellulosic volumes at a level significantly below the statutory volumes and to maintain the biomass-based diesel volume at the level finalized for 2013. In addition, for reasons explained in detail in this notice, EPA is proposing to use authorities granted under the Clean Air Act to adjust the required total and advanced volumes for 2014 below the targets laid out in the statute.

The proposed rulemaking includes a detailed discussion of what is known as the ethanol "blend wall." Today, nearly all gasoline sold across the United States contains ten percent ethanol by volume, commonly referred to as E10. In the years between when Congress created the RFS program and today, production and use of renewable fuels has grown rapidly, but fuel economy improvements and other factors have resulted in lower gasoline consumption than what was projected to occur at the time EISA was enacted. Because of those factors, obligated parties are now facing the E10 blend wall, the point at which the gasoline fuel pool is saturated with ethanol at the 10 percent level, a few years earlier than initially projected.

If gasoline demand continues to decline, as is currently forecasted, increasing the amount of ethanol used in the fuel pool will require greater use of higher ethanol blends such as E15 and E85, or other fuels which don't have such blending limitations. At the present time, however, there are a number of factors that limit the use of these fuels, including the

[1] 78 FR 71732

infrastructure available for distributing, blending, and dispensing renewable fuels, as well as appropriate vehicles in the fleet that can consume various renewable fuels, such as flex-fuel vehicles (FFVs). As a result, using flexibilities built into the law, EPA is proposing to adjust some of the statutory 2014 volume requirements in order to align the program with these current fuel system constraints. EPA discussed the possibility of taking such action in the rulemaking that finalized required volumes under the RFS program for 2013. There, EPA briefly discussed the challenges posed by the E10 blendwall and the higher statutory volume requirements for 2014 and noted that we anticipated proposing adjustments to the 2014 volume requirements to establish volume requirements that are reasonably attainable in light of such considerations.

The proposal includes a lengthy discussion and analysis associated with making adjustments to the RFS program's renewable fuel categories and seeks public comment on several alternative approaches to setting the total and advanced fuel standards described herein. The proposal also includes volume ranges for each biofuel category. Including volume ranges reflects the agency's recognition of the inherent uncertainty in developing projections for biofuel use and provides stakeholders the ability to comment and provide data on a range of volumes and those factors that influence those ranges.

Our approach applies two different authorities in the statute that permit EPA to reduce volumes of advanced biofuel and total renewable fuel below the volumes specified in the statute. When the Administrator lowers the applicable volume of cellulosic biofuel below the volume specified in the Clean Air Act, EPA also has the authority to reduce the applicable

volumes of advanced biofuel and total renewable fuel by the same or a lesser amount. The Administrator can also reduce the applicable volumes of renewable fuel under the general waiver authority provided by the CAA under certain conditions, including if the Administrator makes a determination of "inadequate domestic supply." This proposal uses a combination of these two authorities to reduce volumes of both advanced biofuel and total renewable fuel.

With regard to the specific volumes, the proposed rulemaking proposes the following volumes: for cellulosic biofuel, 17 million gallons (range of 8-30 million gallons); biomass-based diesel, 1.28 billion gallons; advanced biofuel, 2.20 billion gallons (range of 2.00-2.51 billion gallons), and renewable fuel, 15.21 billion gallons (range of 15.00-15.52 billion gallons).

Cellulosic Biofuel. For cellulosic biofuel, the statute specifies that EPA is to project the volume of production and must base the cellulosic biofuel standard on projected available volume if it is less than the applicable volume set forth in the Act. The cellulosic biofuel industry continues to transition from research and development and pilot scale to commercial scale facilities, leading to increases in overall production capacity. Cellulosic biofuel generation from the first commercial scale cellulosic biofuel facility began in March 2013. A second facility began producing fuel in July 2013 with several others expected to follow in 2014. Based on the information we have received from various cellulosic biofuel companies, our conversations with other government agencies, and EPA's own engineering judgment we are projecting that 8 - 30 million ethanol-equivalent gallons of cellulosic biofuel will be available in 2014, and we are proposing a required volume of 17 million gallons. The approach to determining the cellulosic

biofuel standard for 2014 is consistent with a ruling in January 2013 by the U.S. Court of Appeals for the D.C. Circuit.

Biomass-based Diesel. While the Clean Air Act specifies the volumes of biomass-based diesel through year 2012, it directs the EPA to establish the applicable volume of biomass-based diesel for years after 2012. The rulemaking proposes to maintain the applicable volume of 1.28 bill gallons for biomass-based diesel for 2014. Under the statute's system of nested biofuel categories, biomass-based diesel can be used to help meet the volume requirement for advanced biofuel. As discussed in the proposal, EPA believes providing obligated parties the discretion to choose the appropriate method to comply with their advanced biofuel volume requirement is likely to be the most efficient way to achieve the advanced biofuel volume requirements given the market circumstances present in 2014. While the proposed standard for 2014 is 1.28 billion gallons, in developing the total advanced standard – a component of the total renewable standard – EPA used a range of potential biodiesel volumes, with an upper end of 1.6 billion gallons. EPA examined a number of factors in establishing that range. There is some uncertainty regarding a few of these factors which is one of the reasons EPA is seeking additional data and comment on alternative approaches to establishing the range.

Advanced Biofuel and Total Renewable Fuel. Since the RFS program was amended in 2010, EPA has considered reductions in the advanced and total renewable fuel authorized under the statute's cellulosic waiver provisions. In the past we have focused primarily on the

availability of advanced biofuels in determining whether reductions in the advanced and total renewable fuel standards were also appropriate. The total volume of ethanol that could reasonably be available and supplied to vehicles as either E10 or higher blends was not a limiting factor in years prior to 2014. However, for 2014, the total volume of ethanol that can be consumed, and the total volume of non-ethanol renewable fuels that could reasonably be available, are together expected to be less than the volume requirements established in EISA for advanced biofuel and total renewable fuel. To address this, EPA is proposing reductions in the volume requirements for these categories of renewable fuel.

We believe that our proposed framework for determining appropriate volumes of total renewable fuel and advanced biofuel would simultaneously address the ethanol blendwall and limitations in availability of qualifying renewable fuels. For total renewable fuel, we would project the volume of ethanol that could reasonably be consumed as E10 and higher ethanol blends, and would add to that the volume of all non-ethanol renewable fuels that could reasonably be expected to be available. For advanced biofuel, we would sum the ethanol-equivalent volumes of the cellulosic biofuel requirement, the biomass-based diesel requirement, and the additional non-ethanol advanced biofuels that could reasonably be expected to be available and be consumed. The additional non-ethanol advanced biofuel volume includes volumes of biomass-based diesel beyond the 1.28 billion gallon biomass-based diesel standard. Our proposed methodology includes projected ranges that encompass the most likely outcomes, in recognition of the uncertainty surrounding various variables, and we propose several approaches to determining the most likely value within a given range for the final rule.

The proposed rulemaking is now open for public comment for a period of 60 days from publication, which ends January 28, 2014. We have already held a public hearing on the proposal on December 5 where we had the opportunity to hear from multiple stakeholders. EPA recognizes that the RFS volume standards are important to a wide variety of stakeholders, and we look forward to their active engagement on the proposal and to receiving new data.

Finally, EPA also received several petitions from regulated parties to partially waive the statutory volumes for 2014 and set them below the volumes specified in the statute. In an action separate from the Federal Register notice proposing the 2014 volumes, EPA published a second Federal Register notice seeking comment on these petitions. This will also be open for public comment for 60 days from publication, until January 28, 2014. Given the high degree of overlap between the substance of the rulemaking proposal and the waiver petitions, we expect that a determination on the substance of the petitions will be issued at the same time that EPA issues a final rule establishing the 2014 RFS standards.

Other Ongoing Work

EPA is also doing considerable work to evaluate and qualify new advanced and cellulosic biofuels to support the Congressional goals of the RFS program. We have established a process to evaluate new biofuels for use in the RFS program and already have approved a significant

number. In addition, we have received a number of petitions requesting evaluation of new biofuel production processes.

EPA is also working with stakeholders to improve implementation of the RFS program. Compliance under the RFS program is demonstrated through the use of Renewable Identification Numbers (RINs), which document the production and distribution of renewable fuel. Obligated parties supported the use of RINs to provide them added flexibility in meeting the RFS standards. In February 2013, EPA proposed to establish a voluntary quality assurance program for verifying the validity of RINs. This voluntary program was proposed after receiving extensive input from the oil and renewable fuels industries and is intended to improve RIN market liquidity and efficiency and improve the ability of renewable fuel producers to sell their RINs. EPA hopes to finalize this program early next year.

Conclusion

With the approaches discussed in the 2014 proposal, EPA's intention is to put the RFS program on a manageable trajectory that will support continued long-term growth in renewable fuels. EPA is inviting comment on all aspects of the proposed rulemaking, and we have specifically asked stakeholders to provide us relevant and up-to-date data and information on the many issues discussed in the proposal concerning the production and use of various kinds of renewable fuels. EPA looks forward to continued engagement with our stakeholders as we work in consultation with the Departments of Agriculture and Energy toward the development of a final rule.

Again, I thank you for the opportunity to serve as a witness at this hearing for the Committee.

Environment and Public Works Committee Hearing
December 11, 2013
Follow-Up Questions for Written Submission

Questions for Christopher Grundler, Director, Office of Transportation and Air Quality

Questions from:

Senator Barbara Boxer

1. The Renewable Fuel Standard was designed, in part, to incent infrastructure investments in renewable fuels use by creating a stable and expanding market for such fuels. How will EPA's Proposed 2014 Volume Standards incentivize expanded renewable fuels infrastructure in the U.S.?

   Answer: The proposal recognizes the current limitations on renewable fuel production and consumption, while establishing a methodology for setting future standards that will support the opportunity for growth of renewable fuel use over time. The proposed 2014 volumes were based on an estimate of all ethanol that could reasonably be expected to be consumed in 2014, including considerable growth in the assumed consumption of E85 in FFVs compared to 2013. As a result, the proposed volumes were set at a level beyond the estimated E10 blendwall. The proposed 2014 volumes also included all cellulosic biofuel and all non-ethanol advanced biofuel projected to be reasonably available in 2014. As the use of renewable fuels continues to rise, the infrastructure necessary to support them will continue to expand as well. The EPA will evaluate all comments it received on the proposed rule in preparing a final rule establishing the 2014 RFS standards.

2. Can you please explain the specific steps the EPA has taken to address individual cases of RIN fraud? What agency's actions have been taken to prevent future cases of RIN fraud?

   Answer: The EPA has initiated and continues to pursue criminal investigations and civil enforcement proceedings against the companies suspected of fraud and violations of the RFS regulations. The focus of the EPA's enforcement efforts has been on the parties that actually generated invalid RINs. However, once these invalid RINs are in circulation, they continue to be used, and their use for compliance with Renewable Volume Obligations is prohibited by the RFS regulations. To address this issue, the EPA's Office of Enforcement and Compliance Assurance has issued Interim Enforcement Response Policies to provide a streamlined approach to allow parties who used invalid RINs to correct their violations without the EPA commencing a formal enforcement action. To date, the EPA has entered Administrative Settlement Agreements with 39 companies to resolve violations arising from their use of invalid RINs.

   To help prevent future cases of RIN fraud, on July 2, 2014, the EPA issued a final rule to establish a voluntary quality assurance program for verifying the validity of RINs under the RFS program. The goals of the program are to promote greater liquidity in the RIN

market in a way that assures reasonable oversight of RIN generation and to assure use of the required renewable fuel volumes.

Senator Max Baucus

1. Did EPA review the change in market conditions for the oil sector or the renewable fuel sector if your proposed 2014 blending targets were to be adopted? What are the results of these analyses?

   Answer: The EPA proposed to utilize the general waiver authority provided by section 211(o)(7) to reduce the volumes of renewable fuel otherwise required by statute based on "inadequate domestic supply." This does not provide the EPA with authority to waive the standards based on changes in market conditions for the oil or renewable fuel sectors, and such analyses were not carried out for the proposal. The EPA did conduct a thorough analysis of the projected ability for the market to produce and consume renewable fuels in 2014, and that analysis does look at various factors relevant to the fuels market, including both renewable and non-renewable fuels.

2. How do you believe your proposed 2014 blending targets will affect the status of infrastructure investments to deliver renewable fuels?

   Answer: The proposal recognizes the current limitations on renewable fuel production and consumption, while establishing a methodology for setting future standards that will support the opportunity for growth of renewable fuel use over time. The proposed 2014 volumes were based on an estimate of all ethanol that could reasonably be expected to be consumed in 2014, including considerable growth in the assumed consumption of E85 in FFVs compared to 2013. As a result, the proposed volumes were set at a level beyond the estimated E10 blendwall. The proposed 2014 volumes also included all cellulosic biofuel and all non-ethanol advanced biofuel projected to be reasonably available in 2014. As the use of renewable fuels continues to rise, the infrastructure necessary to support them will continue to expand as well. The EPA will evaluate all comments it received on the proposed rule in preparing a final rule establishing the 2014 RFS standards.

3. How does EPA analyze the effects of the interaction between its annual blending targets, review and approval of new feedstock pathways, and other complementary federal programs such as loans, loan guarantees, and grants from the Departments of Energy and Agriculture?

   Answer: The EPA proposes and finalizes applicable volume requirements on an annual basis, and the standards the EPA proposed in November 2013 apply to the 2014 calendar year. To the extent additional pathways are approved, and potential renewable fuel volumes change as a result of other government programs, the EPA will reflect this in the final 2014 standards and in future rules establishing annual standards.

4. What has EPA done to address individual cases of RIN fraud and other potential manipulation in the RIN market as well as what systemic steps you have taken to address these issues?

Answer: The EPA has initiated and continues to pursue criminal investigations and civil enforcement proceedings against the companies suspected of fraud and violations of the RFS regulations. The focus of the EPA's enforcement efforts has been on the parties that actually generated invalid RINs. However, once these invalid RINs are in circulation, they continue to be used, and their use for compliance with Renewable Volume Obligations is prohibited by the RFS regulations. To address this issue, the EPA's Office of Enforcement and Compliance Assurance has issued Interim Enforcement Response Policies to provide a streamlined approach to allow parties who used invalid RINs to correct their violations without the EPA commencing a formal enforcement action. To date, the EPA has entered Administrative Settlement Agreements with 39 companies to resolve violations arising from their use of invalid RINs.

To help prevent future cases of RIN fraud, on July 2, 2014, the EPA issued a final rule to establish a voluntary quality assurance program for verifying the validity of RINs under the RFS program. The goals of the program are to promote greater liquidity in the RIN market in a way that assures reasonable oversight of RIN generation and to assure use of the required renewable fuel volumes.

Several media articles in the fall of 2013 proposed a possible link between RIN price increases and speculation and manipulation of the RIN market by financial institutions. However, data from the EPA's Moderated Transaction System (EMTS) continue to show that the only parties with more than one percent of the market are obligated parties with renewable volume obligations in excess of one percent. The EPA monitors the program's implementation and the RIN market, engaging on a regular basis with the Department of Agriculture and the Department of Energy, as well as the U.S. Commodity Futures Trading Commission (CFTC), which bas regulatory jurisdiction over RIN futures markets.

5. Is it legal to use E15 in a motorcycle?

Answer: No. The E15 waiver was only for 2001 and later model year light-duty vehicles and trucks. The EPA denied the E15 waiver request for motorcycles in the first E15 Partial Waiver decision due to a lack of data demonstrating that E15 would not cause or contribute to the failure of emission controls over motorcycles' full useful lives. The EPA also prohibited the sale and use of E15 in motorcycles in the E15 Misfueling Mitigation Rulemaking due to concerns over the potential harm to motorcycles' emission controls.

Senator Thomas R. Carper

1. Mr. Grundler, can you tell the Committee what the EPA has done to increase transparency in the RIN markets? Does the EPA intend to do more? Are there tools that could help the agency increase transparency that are not legally available to you now?

   Answer: The EPA has taken a number of steps to enhance and increase the data transparency of the RIN tracking system and continues to investigate additional steps. The EPA is implementing a program with a number of features designed by the agency to provide data transparency, consistent with agency obligations regarding the treatment of submissions that are claimed to be confidential business information. Transactional information reported to the EPA Moderated Transaction System by RIN generators, RIN buyers and sellers, and obligated parties is typically claimed as confidential business information (CBI). In most cases, material claimed as CBI may not be made available to the public until a final confidentiality determination (40 CFR Part 2, Subpart B) finds that it is not entitled to be claimed as CBI. In the absence of a final determination, the EPA treats such material as confidential unless its governing regulations provide otherwise. There is a considerable amount of publicly available information related to renewable fuel and RIN data on the EPA website, including RIN generation and renewable fuel volume production by month and by fuel type, available RINs to date, RIN retirements by fuel category and RIN separation by condition (e.g., whether separation was by an obligated party, a blender, an exporter, or a producer). We are exploring ways to increase the amount of data related to RINs that we publish on our website.

2. Mr. Grundler, under EPA's analysis in the recent 2014 proposed rule, the EPA has determined there is not the available infrastructure to handle the increased levels of biofuels required under the Clean Air Act. If the EPA adjusts the RFS downward to meet the current infrastructure, what drives new investments in infrastructure to handle future volume requirements? Can you tell the Committee, how does this nation get past the blendwall under the current proposal? How can this country incentivize the increased investments in E85 pumps, E15 pumps and vehicles that are optimized for future ethanol blends?

   Answer: The proposal recognizes the current limitations on renewable fuel production and consumption, while establishing a methodology for setting future standards that will support the opportunity for growth of renewable fuel use over time. The proposed 2014 volumes were based on an estimate of all ethanol that could be reasonably be expected to be consumed in 2014, including considerable growth in the assumed consumption of E85 in FFVs compared to 2013. As a result, the proposed volumes were set at a level beyond the estimated E10 blendwall. The proposed 2014 volumes also included all cellulosic biofuel and all non-ethanol advanced biofuel projected to be reasonably available in 2014. As the use of renewable fuels continues to rise, the infrastructure necessary to support them will continue to expand as well. The EPA will evaluate all comments it received on the proposed rule in preparing a final rule establishing the 2014 RFS standards.

3. Currently, car companies are starting to make adjustments to meet Tier 3 emissions standards. Can you tell the Committee if the EPA is working with industry to incentivize the production of vehicles that can run on future ethanol blends? If not, why not?

   Answer: Since the 1980s, a major incentive to produce ethanol flexible fuel vehicles (FFVs) has been the availability of credits under the Corporate Average Fuel Economy (CAFE) program. Through the Energy Independence and Security Act (EISA) of 2007, incentives for FFVs are phased down over time. Under the EPA's greenhouse gas (GHG) emissions standards for light-duty vehicles, automakers can achieve GHG emissions credits equivalent to the CAFE credits through 2015. Beginning in 2016, GHG emissions compliance for ethanol FFVs will be based on demonstrated emissions performance on both gasoline and E85, and a determination of the fractions of time that FFVs would use gasoline and E85. Our Tier 3 final rulemaking contains a provision allowing vehicle manufacturers to request approval for an alternative certification fuel such as a 30 percent ethanol by volume blend (E30) for vehicles that may be optimized for such fuel.

4. Many small and mid-range refineries do not have the capabilities to blend and must buy many or all of their RINs on the market. As a result, high and volatile RIN prices have had a large impact on these refineries. As the RFS continues, what can be done – if anything - to assist these smaller refineries?

   Answer: The RFS program as established by EPAct and amended by EISA exempted small refineries from the renewable fuel standards until calendar year 2011. After this initial period, the statute allows that small refineries may, on a case-by-case basis, petition the EPA for an extension of their exemption. The EPA may approve such petitions if it finds that disproportionate economic hardship exists. The EPA continues to implement these provisions. We have acted on four petitions and are reviewing an additional ten for the 2013 compliance period.

5. Do you believe your proposal will impact future advanced biofuel investments – if not, why not?

   Answer: The intent of our proposal was to support ongoing growth in the use of advanced biofuels. Since the proposal was released, we have met with multiple stakeholders to listen to their input on the proposed rule and to solicit any new and relevant data that should be factored into setting the volume standards for 2014. We are currently evaluating the over 300,000 comments we received on the 2014 RFS proposal, and we are assessing any new data that we have received on the availability of advanced biofuel. We will take this new input on advanced biofuels into account in our final rule.

Senator Benjamin L. Cardin

1. Are the challenges of the blend wall the primary driver behind the proposed reduction in 2014 RVO (renewable volume obligations)?

   Answer: The EPA proposed reductions to advanced biofuel and total renewable fuel from the statutory volumes due to the practical realities of the current marketplace and infrastructure constraints, as well as the shortfall in the available supplies of advanced biofuels to meet the statutory volumes. Although we have made significant progress towards the statute's goal of increased renewable fuel use under the RFS program, cellulosic biofuel production has lagged far behind the volumes established in EISA. This has led to an overall shortfall in the advanced biofuel volumes in 2014. In addition, the gasoline market is now saturated with E10, and the opportunities for sales of higher ethanol blends such as E85 are limited by the available infrastructure and by other factors.

   Using flexibilities built into the law, the EPA is proposing to adjust some of the volume requirements set by Congress for 2014 to align the program with the projected ability of the market to supply and consume renewable fuels. The EPA is required to set standards for the RFS program each year, and the law allows the EPA to make adjustments to the law's targets under certain circumstances.

   a. Is ethanol the fuel additive that causes blend wall problems?
   Answer: Yes, ethanol is the fuel additive that the EPA has been addressing when discussing the "E10 blendwall."

   b. Do biodiesel and advanced "drop-in" biofuels contribute to the blend wall problems?
   Answer: Biodiesel and "drop-in" biofuels do not contribute to E10 blendwall issues.

2. Since the advanced biofuel industry generated 3.2 billion gallons worth of RINs in 2013 and most of these fuels do not contribute to the blend wall problem, why is EPA proposing to reduce the advanced biofuel volumes for 2014 to 2.2 billion gallons?

   Answer: The intent of our proposal was to support ongoing growth in the use of advanced biofuels. Since the proposal was released, we have met with multiple stakeholders to listen to their input on the proposed rule and to solicit any new and relevant data that should be factored into setting the volume standards for 2014. We are currently evaluating the over 300,000 comments which we received on the 2014 RFS proposal, and we are assessing any new data that we have received on the availability of advanced biofuel. We will take this new input on advanced biofuels into account in our final rule.

3. Could you explain how the Monte Carlo system EPA proposes will reflect the actual gallons being produced?

Answer: The Monte Carlo method was used in the proposal to combine different sources of renewable fuels, all with different ranges of potential volumes and levels of uncertainty, into a single estimate of potential volume for 2014. The inputs into the Monte Carlo analysis included information on actual renewable fuel production. These inputs will be updated for the final rule to account for more recent information on actual production.

4. Will the mean you are proposing most likely always under estimate actual production?

   Answer: The use of the mean accounts for the uncertainty inherent in making projections of future production, distribution, and consumption capabilities. Thus the mean is equally likely to over-estimate or under-estimate future production. Moreover, the use of a volume higher than the mean as the basis of the applicable standards would increase the likelihood of non-compliance due to insufficient supply.

5. If the biomass-based diesel pool produced around 1.7 billion gallons why is EPA proposing the mandates to be kept at 1.28 for both 2014 and 2015?

   Answer: While the applicable biomass-based diesel (BBD) standard in 2013 was 1.28 billion gallons, the biodiesel industry produced significantly more than the 1.28 billion gallon standard because it was profitable for them to do so. There are a number of factors that influenced this production level, such as the biodiesel tax credit and high ethanol prices, which allowed biodiesel to be competitive in meeting the advanced and total standards in the context of the E10 blendwall. There was also strong demand for biodiesel in other countries in 2013, leading to high levels of export that are not reflected in the use of production volumes alone. To the extent that these or other favorable market conditions exist in 2014, the biodiesel industry would again benefit from production in excess of 1.28 billion gallons.

   The proposed BBD standard was set at a level intended to balance the many different factors the EPA is required to consider when setting this standard. Furthermore, even though we proposed to maintain the BBD standard at 1.28 billion gallons, we also proposed to use biodiesel volumes above 1.28 billion gallons in setting the advanced biofuel standard. It is important to understand that the 1.28 billion gallon standard is a minimum – it is a floor, rather than a cap. Biodiesel production could continue to exceed the level of the BBD standard and compete with other advanced biofuels in meeting the advanced biofuel standard, just as it successfully did in 2013. The EPA is in the process of reviewing the comments received on the proposal and gathering additional data and information. This will be reflected in the standards for the final rule.

6. Why has EPA struggled over the last several years in moving new pathways for biofuels as well as updating the general rules governing the biofuels industry?

   Answer: The EPA already has approved a significant list of advanced and cellulosic biofuels under the RFS program. Please see:
   http://www.epa.gov/otaq/fuels/renewablefuels/new-pathways/rfs2-pathways-

determinations.htm. We have also established a process to evaluate new biofuels for use in the RFS program, and we are actively engaged with stakeholders to expand the number of approved renewable fuel pathways. In June 2013, we issued a proposed rule that will expand the opportunity for the use of additional advanced biofuels, including cellulosic fuels from certain types of biogas. The agency will continue to evaluate additional fuel pathways under the program to support attaining the goals of the RFS program.

However, the RFS program is facing new and different issues on an ongoing basis as the renewable fuels market continues to evolve and grow. In order to carry out its responsibilities, the agency has shifted resources from other program areas to the extent possible, but declining agency resources has made this difficult. To address some of these challenges, on March 13 the EPA posted a program announcement about activities that we are undertaking to improve the petition process for new fuel pathways. Considering resource limitations, we will be setting priorities with respect to petition reviews, such as focusing on pathways that can contribute to meeting the cellulosic biofuel volumes. During the improvement process, the EPA intends to continue reviewing pending petitions that are high priority, and pending petitions for which substantial modeling has already been done.

7. What happens to the proposed cellulosic mandate for 2014 if EPA completes its Pathways Two Rule after you announce the RVOs?

   a. Won't millions of gallons have been added that are known to be coming but are not included in the target?

      Answer: The EPA proposed to incorporate potential cellulosic volumes only from any new pathways that are finalized prior to issuing the final 2014 standards. The EPA issued the Pathways 2 final rulemaking on July 2, 2014, and will account for the volumes associated with these new approved pathways in our rule to finalize the 2014 volumes and percentage standards.

8. What consideration is EPA giving to the negative market signals to advanced biofuel industry investment community that may result from the proposed reductions to the advanced biofuel volumes for 2014?

   Answer: The intent of our proposal was to support ongoing growth in the use of advanced biofuels. Since the proposal was released, we have met with multiple stakeholders to listen to their input on the proposed rule and to solicit any new and relevant data that should be factored into setting the volume standards for 2014. We are currently evaluating the over 300,000 comments which we received on the 2014 RFS proposal, and we are assessing any new data that we have received on the availability of advanced biofuel. We will take this new input on advanced biofuels into account in our final rule.

9. If the blend wall is the primary driver for the proposed RVO, why is EPA cutting 40% for Advanced Biofuels off the 2007 statutory requirement and less than 10% for corn ethanol?

Answer: The EPA proposed reductions to advanced biofuel and total renewable fuel from the statutory volumes due to the practical realities of the current marketplace and infrastructure constraints, as well as the shortfall in the available supplies of advanced biofuels to meet the statutory volumes. Although we have made significant progress towards the statute's goal of increased renewable fuel use under the RFS program, cellulosic biofuel production has lagged far behind the volumes established in EISA. This has led to an overall shortfall in the advanced biofuel volumes in 2014. In addition, the gasoline market is now saturated with E10, and the opportunities for sales of higher ethanol blends such as E85 are limited by the available infrastructure and by other factors.

The EPA proposed to waive the advanced biofuel standard to a level that could be met without exacerbating the E10 blendwall. This resulted in roughly equal reductions of about 1.5 billion gallons for both conventional (non-advanced) biofuel and advanced biofuel. At the same time, the EPA sought comment on two other approaches to setting the advanced biofuel standard. One would increase and the other decrease the proportion of advanced biofuel to conventional biofuel compared to the proposal. The EPA is in the process of reviewing the comments received on the proposal and gathering additional data and information. This will be reflected in the standards for the final rule.

10. Is the conventional ethanol sector now mature enough at the E10 blend wall to no longer need the artificial support of a RFS mandate?

Answer: The EPA does not have a position on that question. Congress directed the EPA to administer the RFS program and our current focus is on implementation.

11. Why doesn't the EISA waiver process (Section 211(o)(7)(B)) need to be amended to better protect livestock and poultry producers by having hard triggers on feedstock supplies and prices?

Answer: Congress directed the EPA to administer the RFS program and our current focus is on implementation. The EPA does not have a position on whether the Section 211(o)(7) waiver process needs to be amended.

12. What guarantees can EPA provide consumers who own and operate lawnmowers, generators, boats and cars that they will not mis-fuel?

Answer: E15 pumps will be clearly labeled in accordance with the conditions placed on the E15 partial waivers and the labeling provisions of the E15 Misfueling Mitigation Rulemaking to help ensure that consumers will not inadvertently misfuel vehicles, engines and equipment not covered by the E15 partial waivers.

13. As the statute requires increased volumes of ethanol in the fuel supply, what guarantees will consumers have that they will be able to purchase E0 and E10 at an affordable price?

Answer: The market will determine what renewable fuels are used to meet the renewable fuels standard, what blends are marketed, and at what prices. While E10 is now ubiquitous, E0 will be supplied to markets where consumers demand it. In our proposed rule for the 2014 RFS volumes, we asked for more information on the volume of E0 currently used in the gasoline pool.

14. Do you feel that a label simply notifying the consumer of an E15 pump, a label that doesn't even warn of the potential hazards of misfueling, provides the adequate assurances against misfueling?

Answer: The EPA requires that the E15 label include language warning consumers that the misfueling of vehicles, engines, and equipment not covered by the E15 partial waivers may cause damage to those engines. The EPA worked closely with labeling experts at the Federal Trade Commission and affected industry stakeholders through the E15 Misfueling Mitigation Rulemaking process to ensure that effective misfueling mitigation measures were developed. The EPA continues to believe that the misfueling mitigation measures adopted after extensive public engagement are reasonable, appropriate and sufficient to address E15 misfueling concerns.

15. If the majority of ethanol plants are failing to achieve the greenhouse gas reduction for ethanol, how confident are you that the industry will meet future greenhouse gas reduction requirements?

Answer: The Clean Air Act exempt facilities that commenced construction prior to enactment of the 2007 Energy Independence and Security Act from the otherwise generally applicable 20% minimum greenhouse gas reduction threshold for renewable fuels. The statute also does not require that these facilities make upgrades in order to achieve the 20% threshold. However, industry surveys suggest that dry mill ethanol plants in the United States are becoming more efficient. The EPA has received a number of petitions from corn ethanol plants requesting qualification for the generation of renewable fuel RINs based on the use of efficient processing technologies that can reduce greenhouse gas emissions. To date, the EPA has reviewed and approved eight of these petitions for corn ethanol plants that use standard dry mill technologies, suggesting other corn ethanol plants could meet the greenhouse gas requirements using currently available technologies.

16. By your assessment, has the body of scientific work published since 2005 indicated that the overall environmental and human health impacts of corn ethanol are now more significant and widespread than previously thought?

Answer: The EPA has not performed a comprehensive assessment of the entire body of scientific work since 2005. However, a number of different organizations have assessed

(and continue to examine) the impacts of the RFS program on human health and the environment, including the impacts of corn ethanol. In 2012, the EPA issued a Report to Congress on the environmental impacts of the RFS program, as required by the Energy Independence and Security Act (EISA's Section 204 Report). Congress also required the National Academies to review the RFS program, and the National Research Council issued their report in 2011 (*Renewable Fuel Standard: Potential Economic and Environmental Effects of U.S. Biofuel Policy*). Those reports provide a starting assessment of the environmental impacts of biofuels and the RFS program. For example, the reports concluded that much of the environmental impact of biofuel production depends on the feedstock used. For example, feedstocks that require more water or more fertilizer are likely to have a greater impact on the environment.

In the regulatory impact analysis that accompanied the "Regulation of Fuels and Fuel Additives: Changes to Renewable Fuel Standard Program; Final Rule" (RFS2 final rule) in 2010, the EPA analyzed the criteria pollutant air quality and related health impacts of RFS2 volumes in 2022, compared to both volumes required by RFS1 and compared to those projected by AEO 2007. This analysis projected increases in population-weighted annual average ambient PM and ozone concentrations, which in turn lead to health impacts such as premature mortality. In that same analysis, the EPA also projected that ethanol made from corn starch contributed to greenhouse gas emission reductions through 2022. The EPA is also continuing its analysis to support the "anti-backsliding study," which Clean Air Act sections 211(q) and (v) direct the EPA to conduct to determine whether required renewable fuel volumes will adversely impact air quality. That analysis will be based on the EPA's most recent data on the effects of ethanol on vehicle and engine emissions.

Senator Kirsten E. Gillibrand

1. Currently, the USDA provides resources and support for biofuel infrastructure and development through programs like the Biomass Crop Assistance Program (BCAP). For 2014, EPA has proposed lower renewable volume obligations for refiners and importers of petroleum based gasoline or diesel fuel despite the production of more biofuel than originally anticipated. Can you explain the impact that this reduction will have on advanced biofuel production activities funded by BCAP and on rural economies?

   Answer: The EPA has been engaged with USDA from the outset of our regulatory development process for the RFS program since 2005. However, the EPA would defer to USDA with regard to specific activities funded by the USDA BCAP program.

2. Eleven States and the City of New York have implemented or proposed using more biodiesel for all diesel fuel and/or heating oil sold in those regions. This increased demand for biodiesel suggests an expanding market for biodiesel producers. Why then is the 2014 proposed biodiesel production target set below the projected 1.28 billion gallon production estimate for 2014? How will this proposed reduction impact the emerging biodiesel market in New York State and New York City?

   Answer: While the applicable biomass-based diesel (BBD) standard in 2013 was 1.28 billion gallons, the biodiesel industry produced significantly more than the 1.28 billion gallon standard because it was profitable for them to do so. There are a number of factors that influenced this production level, such as the biodiesel tax credit and high ethanol prices, which allowed biodiesel to be competitive in meeting the advanced and total standards in the context of the E10 blendwall. There was also strong demand for biodiesel in other countries in 2013, leading to high levels of export that are not reflected in the use of production volumes alone. To the extent that these or other favorable market conditions exist in 2014, the biodiesel industry would again benefit from production in excess of 1.28 billion gallons.

   The proposed BBD standard was set at a level intended to balance the many different factors the EPA is required to consider when setting this standard. Furthermore, even though we proposed to maintain the BBD standard at 1.28 billion gallons, we also proposed to use biodiesel volumes above 1.28 billion gallons in setting the advanced biofuel standard. It is important to understand that the 1.28 billion gallon standard is a minimum – it is a floor, rather than a cap. Biodiesel production could continue to exceed the level of the BBD standard and compete with other advanced biofuels in meeting the advanced biofuel standard, just as it successfully did in 2013. Thus, if finalized, the proposed 2014 standards should continue to support the growth in the emerging biodiesel market not only in New York State and New York City, but across the country. The EPA is in the process of reviewing the comments received on the proposal and gathering additional data and information. This will be reflected in the standards for the final rule.

Senator David Vitter

1. The Energy Information Administration estimated the following for U.S. consumption of ethanol: 12.9 billion gallons in 2010, 12.9 billion gallons in 2011, and 12.9 billion gallons in 2012. It may be around 13 billion gallons for 2013. Given your Agency's 2014 proposed RVO, what is EPA's projection of ethanol consumption in 2014?

   Answer: In the 2014 volume rule proposal, the EPA estimated ethanol consumption for 2014 would be 13.0 Bgal, comprised of 12.9 Bgal of E10 and 180 Mgal though sales of E85.

2. Does EPA's proposed 2014 RVO actually cut corn ethanol consumption from where we are this year (2013)?

   Answer: No. Actual domestic consumption of ethanol in 2013 was about 13 billion gallons, the same as the EPA has proposed for conventional (non-advanced) biofuel in 2014. However, there is no specified volume requirement under the RFS program specifically for corn ethanol.

3. Please describe EPA's authority to reduce the advanced mandate by the amount of the cellulosic mandate and why EPA decided to exercise that authority in the proposed 2014 RVO.

   Answer: If the Administrator waives the cellulosic biofuel standard, Section 211(o)(7) of the Clean Air Act allows the Administrator to reduce the level of the advanced and total renewable fuel standards by up to the same amount. The EPA projected volumes of all non-ethanol advanced biofuel that were reasonable to believe would be produced in 2014 at the time the proposal was developed. This volume fell short of the advanced biofuel standard otherwise required by the statute, prompting the EPA to propose to waive the standard to the projected level. The EPA is in the process of reviewing the comments received on the proposal and gathering additional data and information. This will be reflected in the standards for the final rule.

4. Please describe how EPA concluded that the blend wall exists.

   Answer: The E10 blend wall is defined as the point at which the gasoline fuel pool is saturated with ethanol at the 10 percent level in order to meet the RFS standards. Based on our analysis of all relevant data, we determined that this limit was reached in 2013.

5. If EPA were to promulgate increased volumes (higher values) for ethanol in 2014 (closer to statutory levels), how much E85 would be necessary to achieve such blending requirements? How much E85 is currently being used?

   Answer: In the proposal, it was estimated that about 100 million gallons of E85 would be consumed in 2013. If the 2014 statutory volume of 18.15 billion gallons for total renewable fuel were not waived, total consumption of E85 would likely need to be many

times higher than 100 million gallons. However, the RFS mandates need not be met with only ethanol. As a result, there is no single answer to this question.

6. Since July of 2010 EPA recorded the price of every RIN transaction. How does that square with comments that RINs are really free? Are RINs really free?

   Answer: RINs are generated upon production of renewable transportation fuels and are required to be sold with the fuel by the producer. The price paid in this situation is for both the value of renewable fuel itself and the value of the RIN that comes with it.

7. Was EPA's E15 testing protocol specifically designed to test more than the emissions control system on MY2001 cars, or were the parameters limited to the emissions control device with only observations on the rest of the car?

   Answer: The test data and other information that the EPA relied upon in reaching its waiver decisions came from a number of sources that in many cases evaluated the potential impacts of E15 on vehicle characteristics beyond simply emissions performance. The EPA did not conduct testing specifically to evaluate the E15 waiver request. The EPA issued its E15 partial waiver decisions which allow model year 2001 and newer light-duty motor vehicles to use gasoline containing up to 15 volume percent ethanol (E15) based on an extensive review of all relevant scientific and engineering information. Across the approximately 30 studies the EPA used to support its waiver decisions, which includes the comprehensive work conducted by the Department of Energy (DOE), no fuel-related issues regarding fuel system compatibility or engine durability arose when the fuel systems and/or engines were operated or tested on E15. Taken together, these studies represent the operation of hundreds of vehicles over millions of miles on E15 under real world and testing conditions without issue. More specific to the EPA's authority to grant waivers under section 211(f)(4) of the Clean Air Act, model year 2001 and newer light-duty motor vehicles continued to meet applicable federal emissions standards over the vehicles' full useful lives when operated and tested on E15.

8. Why were the 2013 and 2014 rules so late? What measures are being taken to ensure the rules come out on time in future years?

   Answer: The RFS touches a range of complex environmental, energy and agricultural issues, and public comment adds to the timelines for issuing such standards. The EPA is currently considering how to improve our internal regulatory processes in order to meet established deadlines. The EPA will be engaging our interagency partners and will identify any areas that could be streamlined for a more efficient and timely promulgation of future rules.

9. Does EPA have an estimate for the total cellulosic capacity under construction? Does EPA have an estimate for the total other advanced (non-biomass based diesel/non-cellulosic) capacity under construction?

Answer: For the 2014 annual standards proposal, the EPA has projected cellulosic biofuel and total advanced biofuel production for 2014. While the EPA tracks ongoing developments in biofuel production, our focus for the annual rulemakings is on potential production volume for the calendar year in question. The EPA does not track closely the many other facilities in varying states of construction that may be relevant in future years.

10. Please describe the key assumptions behind the Monte Carlo analysis used for the proposed 2014 RVO and in particular the cellulosic numbers. Why is this process more accurate, particularly when considering the production numbers for 2013 and the fact that the cellulosic industry is on track to reach only 11% of the target set in August?

    Answer: The volume projections presented in the proposal were based on a facility-by-facility assessment, consistent with the approach used in previous years. The Monte Carlo analysis was used as a means to address uncertainty in the projections from the various different facilities and combine them into an overall range of potential volumes for 2014. Such an approach was not necessary for 2013, as there were only two companies with potential volumes for 2013, but we believe it will help to improve the accuracy of projections for 2014 and beyond.

11. In California, due to the state's Low Carbon Fuel Standard, Brazilian ethanol is a primary compliance mechanism. What impact will your rule have on California's Low Carbon Fuel Standard?

    Answer: Sugarcane ethanol qualifies as an advanced biofuel under the RFS program, and it has historically been imported into the U.S., with the majority coming from Brazil. We understand that Brazilian ethanol is also used to comply with California's Low Carbon Fuel Standard (LCFS). The EPA has not conducted an analysis assessing the impact our proposed RFS standards for 2014 would have on California's LCFS.

12. During EPA Administrator Gina McCarthy's nomination process, she was asked if EPA was considering or had plans to establish a Low Carbon Fuels Standard and the response was negative. Is that still the case?

    Answer: At the time, the Administrator responded that the agency is not considering nor does it currently have any plans to establish a Low Carbon Fuel Standard under the Clean Air Act. That answer is still correct.

Senator Roger F. Wicker

1. Despite the fact that ethanol cannot be added to diesel fuel – and biodiesel cannot be added at more than 5% - the total renewable volume obligation for refiners includes both their gasoline and diesel production. Has the EPA considered how this disproportionately affects refiners who produce more diesel than gasoline?

   Answer: This is an issue that we proposed and sought comment on in "Regulation of Fuels and Fuel Additives: Changes to Renewable Fuel Standard Program; Final Rule" (RFS2 final rule) in 2010. Refiners overwhelmingly supported an approach that based their obligations on the sum of their gasoline and diesel production rather than applying standards separately to gasoline and diesel.

   Since the RFS standards in both EPAct and EISA are generally neutral with respect to the type of renewable fuel used and not a simple mandate for ethanol to be blended into gasoline or biodiesel into diesel fuel, there is no clear component that applies specifically to gasoline or diesel fuel. The possible exception is the biomass-based diesel standard. However, the biomass-based diesel standard is a subset of the advanced and total standards. The RFS program is also neutral with respect to the type of renewable fuel used, in what concentration, and in replacing what transportation fuel (or heating oil or jet fuel). Consequently to allow any qualifying renewable fuel (ethanol, biodiesel, renewable diesel, biogas, biobutanol, etc.) used to replace any transportation fuel, heating oil or jet fuel to be used to demonstrate compliance, the EPA designed the RFS regulations centered around the flexibility afforded by the use of RINs. RINs generated upon the production of a renewable fuel are then used to demonstrate compliance. This enables obligated parties (refiners and importers) to comply regardless of whether they produced gasoline, diesel or both.

2. Studies conclude that gasoline with 15 percent ethanol, or E15, can cause premature engine damage and reduce fuel efficiency. A number of auto manufacturers have already said warranty coverage would not apply to vehicle damage resulting from gasoline with the higher blend of ethanol. What are the risks of expanded use of E-15 to automakers and gasoline-using equipment?

   Answer: Based on the test data and the engineering analysis on which the E15 partial waivers were based, the EPA believes that there are no risks to the emissions control systems of model year 2001 and newer light-duty vehicles (i.e., vehicles in which E15 may be used per the partial waiver decisions) fueled with E15. For model year 2000 and older motor vehicles and all nonroad vehicles, engines, and equipment (collectively "nonroad products"), the EPA concluded in its E15 waiver decisions and the E15 Misfueling Mitigation rulemaking that E15 use in these vehicles and engines may harm their emissions controls. Through the conditions on the E15 waivers and through the E15 Misfueling Mitigation Rulemaking, the EPA implemented several misfueling mitigation measures to limit the risk of E15 use in model year 2000 and older vehicles and nonroad products.

3. Can you please comment on whether EPA has considered the significant volatility in the grain markets caused by the renewable fuel mandates, specifically addressing corn prices?

Answer: The EPA acknowledges that the RFS can influence corn prices, although it is important to note that there are many different factors that affect corn and other grain prices, and thereby influence price volatility. The RFS program itself is neutral with respect to the type of renewable fuel used and from what feedstock it is derived as long as the fuel meets the definitions provided in the Clean Air Act. In the RFS final rule, the EPA estimated that the increase in renewable fuel volumes needed to meet the RFS2 requirements would result in an increase in U.S. corn prices of approximately 8 percent by 2022.

Senator Deb Fischer

1. Until the Agency issued its proposed rule establishing 2014 Renewable Volume Obligations under the RFS, EPA's consistent and carefully balanced implementation of the RFS has previously provided cellulosic and advanced biofuel developers and investors with the confidence that *if they can produce these biofuels, there will be a market for them.* This has helped biofuel producers overcome the challenges in meeting production goals due to innovation scale-up and perfecting first-of-a-kind technology. I have heard from advanced biofuel producers who say that your proposal breaks the fundamentals of the RFS by eliminating the certainty around the market for their product. Given this, where do you see the industry going in the next few years given the devastating impact that the Agency's proposed rule would have on the sector if adopted? Please explain the most important mechanism you see in your proposed rule that will continue to drive investment in the advanced biofuels space.

   Answer: The intent of our proposal was to support ongoing growth in the use of advanced biofuels. Since the proposal was released, we have met with multiple stakeholders to listen to their input on the proposed rule and to solicit any new and relevant data that should be factored into setting the volume standards for 2014. We are currently evaluating the over 300,000 comments which we received on the 2014 RFS proposal, and we are assessing any new data that we have received on the availability of advanced biofuel. We will take this new input on advanced biofuels into account in our final rule.

2. Due to regulatory delays within EPA, a number of producers and investors continue to wait for evaluation and approval of their RFS feedstock pathways. This in turn prevents from scaling up to commercial production of cellulosic and advanced biofuels.

   a. Is EPA on track with its approval of enough diverse feedstock pathways to ensure that producers from all regions of the country can help us meet our RFS goals?

      Answer: We have already approved a diverse set of feedstock pathways but continue to add to this list. Please see: http://www.epa.gov/otaq/fuels/renewablefuels/new-pathways/rfs2-pathways-determinations.htm .

   b. How many pathways has the Agency approved, and what is the average length of time it takes for a new applicant to receive approval?

      Answer: The EPA considers a fuel pathway to be a unique combination of a feedstock, fuel production technology and type of fuel. Using this definition, the EPA has approved over 200 renewable fuel pathways as eligible to generate RINs. The average review time for completed petition determinations has been 15 months.

   c. How can EPA expedite additional pathway approval in the near future, so U.S. companies can continue to deploy innovative technologies and produce the additional volumes necessary to meet our cellulosic and advanced biofuel volume goals?

Answer: In March of this year, the EPA announced an initiative to improve the petition process for new fuel pathways, including several elements:

- Undertaking a "Lean" government exercise to improve the quality, transparency and efficiency of our internal review processes.
- Developing improved guidance for petitioners, including step-by-step instructions and application templates for different types of petitions.
- Launching a more automated review process for petitions using previously approved feedstocks and well known production process technologies (e.g., dry mill ethanol plants).

3. What steps has EPA taken to address RIN fraud?

Answer: The EPA has initiated and continues to pursue criminal investigations and civil enforcement proceedings against the companies suspected of fraud and violations of the RFS regulations. The focus of the EPA's enforcement efforts has been on the parties that actually generated invalid RINs. However, once these invalid RINs are in circulation, they continue to be used, and their use for compliance with Renewable Volume Obligations is prohibited by the RFS regulations. To address this issue, the EPA's Office of Enforcement and Compliance Assurance has issued Interim Enforcement Response Policies to provide a streamlined approach to allow parties who used invalid RINs to correct their violations without the EPA commencing a formal enforcement action. To date, the EPA has entered Administrative Settlement Agreements with 39 companies to resolve violations arising from their use of invalid RINs.

To help prevent future cases of RIN fraud, on July 2, 2014, the EPA issued a final rule to establish a voluntary quality assurance program for verifying the validity of RINs under the RFS program. The goals of the program are to promote greater liquidity in the RIN market in a way that assures reasonable oversight of RIN generation and to assure use of the required renewable fuel volumes.

Senator BOXER. OK. And we will put the rest of your statement in the record.

Mr. GRUNDLER. Thank you.

Senator BOXER. Mr. Steven Chalk.

STATEMENT OF STEVEN CHALK, DEPUTY ASSISTANT SECRETARY FOR RENEWABLE POWER, U.S. DEPARTMENT OF ENERGY

Mr. CHALK. Thank you, Chairman Boxer, Ranking Member Vitter, Chairman Carper, Ranking Member Sessions and members of the Committee. Thank you for the opportunity to discuss the Department of Energy's work on renewable fuels.

As part of the President's sustained all-of-the-above approach to American energy, the Department is working to develop a diversity of advanced fuel and vehicle technologies that can secure our energy future and provide consumers with greater choice with the goal of saving energy, reducing costs and addressing climate change.

As Deputy Assistant Secretary in the Office of Energy Efficiency and Renewable Energy, I am responsible for overseeing DOE's portfolio of renewable energy research, development, demonstration and deployment. The Department supports the goal of the Renewable Fuel Standard to increase biofuel production and use and is investing and research, development and demonstration to help bring next generation biofuels online. This an important component of the Department's work to leverage partnership between the private and public sectors, to deploy cleaner fuels, including advanced batteries and fuel cell technologies, in every transportation mode.

Today, I will address DOE's Bioenergy Technologies Office's role and progress in transforming our renewable biomass resources into commercially viable, high performance biofuels and bio-products.

While the majority of the ethanol in the U.S. fuel market today is starch based, DOE is making important strides in the demonstration and early commercialization of non-food based cellulosic ethanol which can be used to displace gasoline for light duty vehicles. Over the past 10 years, breakthroughs in biomass pretreatment and enzymes have helped reduce the model costs of cellulosic ethanol from over $13 a gallon in 2001 to approximately $3.25 per gallon, and this is on a gasoline equivalent basis.

This model costs reflects the current status of the technology and includes projected learnings and refinements that are validated through early commercialization-scale demonstrations.

DOE and the bioenergy community are now leveraging the cellulosic ethanol research success to accelerate the cellulosic and algal drop-in biofuels that can be used to substitute for petroleum-based gasoline, diesel and jet fuel. Successful R&D investments in cellulosic ethanol have provided the foundational knowledge and capabilities at universities, national laboratories and industry to develop the more challenging bio-based hydrocarbon fuels.

These drop-in hydrocarbon biofuels are advantageous because they are largely compatible with the existing infrastructure to deliver, blend and dispense the fuels. Also, drop-in fuels can be used in heavy duty vehicle applications, aviation, home heating oil and

other transportation modes to displace diesel and jet fuel in addition to gasoline.

Through research and development demonstration, DOE seeks to contribute significantly to making cellulosic and algal-based drop-in biofuels cost competitive with petroleum-based fuels. Our goal is to develop a sustainable pathway to achieve a model cost of $3 per gallon by 2017 and by 2022 validate multiple technology pathways which means various sustainable feedstocks and conversion processes.

DOE's biofuels demonstration and deployment activities focus on integrated bio-refineries. As of September of this year, we have 24 active projects, 17 of which are either under construction or in operation. These competitively awarded projects are cost-shared by industry so that taxpayer investments are reduced.

These first-of-a-kind projects at the pilot demonstration and pioneering commercial scales validate the key technical and economic performance parameters which inform our future R&D investments and provides information on the technologies' commercial readiness. With the first pioneer-scale demonstration facility producing initial product in 2013, it is expected that additional commercial-scale facilities will come online in 2014.

DOE's renewable fuels and transportation technologies portfolio benefits consumers, reduces greenhouse gases, reduces our dependence on oil and keeps America competitive and on the cutting edge of clean transportation energy technologies.

Thank you for the opportunity to discuss these issues, and I welcome any questions.

[The prepared statement of Mr. Chalk follows:]

WRITTEN STATEMENT OF

STEVEN CHALK

DEPUTY ASSISTANT SECRETARY FOR
RENEWABLE POWER

OFFICE OF ENERGY EFFICIENCY & RENEWABLE ENERGY
U.S. DEPARTMENT OF ENERGY

BEFORE THE
COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS
UNITED STATES SENATE

DECEMBER 11, 2013

INTRODUCTION

Chairman Boxer, Ranking Member Vitter, and Members of the Committee, thank you for the opportunity to discuss the Department of Energy's (DOE's) work on renewable fuels.

As part of the President's sustained, all-of-the-above approach to American energy, the Department is working to develop a diversity of advanced fuel and vehicle technologies that can secure our energy future and provide consumers with greater choice with the goal of saving energy, reducing costs and addressing climate change.

As Deputy Assistant Secretary in the Office of Energy Efficiency and Renewable Energy (EERE), I am responsible for overseeing DOE's portfolio of renewable energy research, development, demonstration, and deployment activities.

Biofuels have an important role to play in increasing our energy security, fostering rural economic development, and reducing greenhouse gas emissions from the transportation sector. The Department supports the goal of the Renewable Fuels Standard to increase biofuel production and use, and is investing in research, development, and demonstration (RD&D) to help bring next-generation biofuels on line. This is an important component of the Department's work to leverage partnerships between the private and public sectors to deploy cleaner fuels, including advanced batteries and fuel cell technologies, in every transportation mode.

The transportation sector accounts for approximately two-thirds of the United States' oil consumption and contributes to one-third of the Nation's greenhouse gas (GHG) emissions.[1] Net expenditures for imports of crude and petroleum products have been hundreds of billions of dollars every year. After housing, transportation is the second biggest annual expense for most American families.[2] Improving fuel efficiency of vehicles and developing alternative fuels represents one of the best opportunities we have to reduce our dependence on oil and lower our transportation costs. The economic, national security and environmental costs of our existing vehicles and transportation infrastructure make developing advanced, more fuel-efficient vehicles and alternative fuels an imperative for the Nation.

Today, I will address DOE's role and progress in the research, development and demonstration of advanced biofuel and associated vehicle technologies.

---

[1] http://www.eia.gov/totalenergy/data/annual/pecss_diagram.cfm and http://www.eia.gov/oiaf/aeo/tablebrowser/#release=AEO2012&subject=0-AEO2012&table=17-AEO2012&region=1-0&cases=ref2012-d020112c

[2] http://www.bls.gov/news.release/cesan.nr0.htm

VEHICLE PROGRESS AND EFFORTS

Biomass is a direct, near-term alternative energy resource for supplying liquid transportation fuels to the nation. Starch-based ethanol is a well-established commodity fuel with wide market acceptance through low- level blends in conventional vehicles and at higher blends in flex-fuel vehicles. The vast majority of the ethanol in the U.S. fuel market today is starch-based ethanol, as cellulosic ethanol technology is currently moving towards early commercialization. In the United States, nearly all gasoline is now blended with ethanol, up to 10% by volume (known as E10).

In November 2010 and January 2011, the Environmental Protection Agency (EPA) issued partial waivers that permit the use of gasoline containing up to 15% ethanol by volume (or E15) in model-year 2001 vehicles and newer. DOE worked closely with EPA to provide data needed to determine the potential impact of E15 on compliance with vehicle and engine emission standards established under the Clean Air Act. Using DOE and other test data, EPA ultimately determined that E15 may be introduced into commerce for use in model year 2001 and newer passenger vehicles. This means that EPA has approved the use of E15 for about 65 percent of the passenger vehicles on the road, vehicles that are estimated to account for more than 70% of the miles driven.[3]

DOE estimates approximately 6 percent (14 million out of approximately 237 million) of passenger vehicles on the road today are already manufactured to be compatible with blends up to 85 percent ethanol. Roughly 20 percent of new vehicle sales are also E85-compatible, though the infrastructure to dispense high-level ethanol blends such as E85 is not widely available.[4] DOE estimates that the incremental cost of manufacturing vehicles to be E85-compatible is in the range of $50-$100/vehicle.[5]

PROGRESS ON ADVANCED BIOFUELS

The Department of Energy's Bioenergy Technologies Office aims to develop and transform our renewable biomass resources into commercially viable, high performance biofuels and bioproducts through targeted RD&D supported through public-private partnerships.

---

[3] Vehicle fleet age modeling by Argonne National Laboratory using the VISION model on December 4, 2012. Using VISION AEO 2013 Base Case, September, 2013. Available at: www.transportation.anl.gov/modeling_simulation/VISION/

[4] There were 2,637 stations dispensing E85 as of Nov. 25, 2013. See: http://www.afdc.energy.gov/fuels/stations_counts.html

[5] R.L. Polk & Co.

Cellulosic Ethanol

Cellulosic ethanol, like starch-based ethanol, can be used to displace gasoline for light duty vehicles. Through research and development (R&D) efforts, the cost of converting cellulosic biomass to fuel ethanol is becoming competitive. Over the past ten years, breakthroughs in biomass pretreatment and enzymes have helped reduce the modeled costs of cellulosic ethanol produced via biochemical conversion from over $13.40 per gallon gasoline equivalent in 2001 to a modeled mature technology, wholesale finished fuel cost of less than $3.26 per gallon gasoline equivalent.[6] After DOE successfully demonstrated technologies to produce cost-competitive cellulosic ethanol in FY 2012—the culmination of two decades of conversion technology R&D—the first pioneer scale demonstration facility produced its initial product in 2013.

Drop-In Fuels

DOE and the bioenergy community are now leveraging cellulosic ethanol RD&D successes to accelerate cellulosic and algal "drop-in" biofuels technologies that can be used to displace petroleum-based gasoline, diesel and jet fuel. Successful RD&D investments in cellulosic ethanol have provided foundational knowledge and capability at national laboratories, in industry and at universities to develop the more challenging bio-based gasoline, diesel, and jet fuels. "Drop-in" hydrocarbon biofuels are advantageous because they are largely compatible with existing infrastructure to deliver, blend, and dispense fuels. Also, "drop-in" fuels can be used in heavy duty vehicle applications, home heating oil, and other transportation modes to displace diesel and jet fuel in addition to gasoline. Through RD&D, DOE seeks to contribute significantly to making cellulosic "drop-in" biofuels competitive with petroleum-based fuels, achieving a modeled mature-technology wholesale finished-fuel cost of renewable gasoline, diesel and jet fuel of less than $3.00 per gallon by 2017,[7] and validate multiple technology pathways (i.e. a diversity of feedstocks and conversion options) by 2022.

EERE's conversion R&D is focused on developing technologies to convert feedstocks into commercially viable liquid transportation fuels, as well as bioproducts. Moreover, EERE's feedstock supply R&D is focused on developing technologies to provide a reliable, affordable, and sustainable biomass supply. This R&D is conducted in partnership with the U.S. Department of Agriculture (USDA) and DOE's Office of Science and the Advanced Research Projects Agency-Energy (ARPA-E). EERE's primary focus is on feedstock resource assessment, feedstock logistics (i.e., harvesting, storage and transportation) and algal feedstock supply R&D.

[6] See: http://www.nrel.gov/docs/fy14osti/60663.pdf

[7] At $3.00 per gallon, DOE estimates that these biofuels would be approximately cost-competitive with equivalent petroleum-based fuels produced at a crude oil price of $100 per barrel.

Integrated Biorefineries

DOE's biofuels demonstration and deployment activities focus on Integrated Biorefineries. As of September 2013, the Bioenergy Technologies Offices has 24 active biorefinery projects, 17 of which are either under construction or in operation. These competitively awarded projects are cost-shared by industry so that taxpayer investments are reduced. The objective of these first-of-a-kind technology projects at pilot, demonstration, and pioneer commercial scales is to validate key technical and economic performance parameters. The critical data from these various demonstrations then feeds back to inform our future R&D investments and provides information on the technologies' commercial readiness.

With the first pioneer scale demonstration facility producing initial product in 2013, it is expected that additional commercial scale facilities will come online in 2014. DOE has played a major role in development of technology and scale up in four commercial scale biorefineries either complete or under construction. Once these plants successfully pass through commissioning and start up phases, they are expected to produce up to 80 million gallons per year of advanced biofuels during steady-state operations. Pilot-scale, demonstration-scale, and pioneer, first-of-a-kind commercial-scale integrated biorefineries are critical components of the Federal government's efforts to advance the commercialization of biofuels from non-food sources by validating the technical, environmental and economic goals necessary for cost-competitive production.

Intra-DOE and Interagency Support

Within DOE, programs in EERE, the Office of Science, ARPA-E, and the Loan Guarantee Program have all made coordinated investments in next- generation biofuels technologies. DOE also works closely with EPA, USDA, the Department of Defense, the Department of Transportation's Federal Aviation Administration and other Departments and agencies to accelerate U.S. use of renewable fuels.

CONCLUSION

With efforts like DOE's bioenergy technology development program, the Department believes the United States can position itself as a leader in the global clean energy sector. Working with industry and state and local partners from across the country, DOE's renewable fuels and transportation technologies portfolio will benefit consumers, reduce greenhouse gas emissions, improve national security through reducing our dependence on oil, and keep America competitive and on the cutting edge of clean transportation energy technologies. Thank you again for the opportunity to discuss these issues, and I welcome any questions.

QUESTION FROM SENATOR BOXER

Q1. Can you please provide an explanation of DOE's E15 fuel testing and the testing results that supported the Environmental Protection Agency's approval of E15 for use in motor vehicles?

A1. The Department conducted robust testing of the potential effects of E15 and E20 on vehicles and engines. This work included an examination of emissions, catalyst and engine durability, drivability and operability, and materials compatibility, and covered both automobile engines as well as smaller engines. The catalyst durability study—which represented about half of the spending, included 86 vehicles driven more than six million miles, used more than 300,000 gallons of fuel, and included about 1,000 emissions tests. A subset of vehicle engines (18) were torn down after completion of the testing and no unusual fuel-related damage or accelerated wear was found in those engines operated on E15 or E20.

The primary criterion for new fuel or fuel additive approval specified in the Clean Air Act is whether the candidate fuel damages the emissions control systems of vehicles over their full useful life (currently 120,000 miles). The Department's test program used the Standard Road Cycle, a test cycle specified in EPA regulations in the CFR for aging vehicles to full-useful life. Statistical analysis of the test fleet emissions results showed that aging vehicles with ethanol blends did not affect emissions changes over time differently than aging with E0. The Department also conducted studies of the immediate emissions effects, drivability of vehicles, fuel system materials compatibility, and operability and durability of engines.

QUESTION FROM SENATOR CARPER

Q1. **Under EPA's analysis in the recent 2014 proposed rule, the EPA has determined there is not the available infrastructure to handle the increased levels of biofuels required under the Clean Air Act. If the EPA adjusts the RFS downward to meet the current infrastructure, what drives new investments in infrastructure to handle future volume requirements? Can you tell the Committee, how does this nation get past the blend wall under the current proposal? How can this country incentivize the increased investments in E85 pumps, E15 pumps, and vehicles that are optimized for future ethanol blends?**

A1. The U.S. Department of Energy (DOE) recognizes that the blend wall is a critical issue for the biofuels industry. Under cost-shared partnerships with industry, DOE has made significant investments to catalyze the commercialization of advanced cellulosic ethanol technologies by demonstrating several pioneer commercial-scale biorefineries. As these plants come on line, investors will have the cost and technical data necessary to decide whether to build additional supply. New cost-competitive biofuel supply coming on line will impact future Renewable Fuel Standard adjustments by the U.S. Environmental Protection Agency and increase demand for biofuels. In turn, the market can respond to this increased demand by investing in refueling and distribution infrastructure. In the longer term, DOE's Bioenergy Technologies Office is collaborating with partners in industry and at universities and the national laboratories to invest in the research, development, and demonstration of biorefineries that will produce advanced hydrocarbon biofuels—produced from cellulosic biomass and algae. These fuels—bio-based gasoline, diesel, and jet fuel—often described as "drop-in" fuels, are largely compatible with existing petroleum-based distribution and vehicle infrastructure and not to be impeded by the "blend-wall."

QUESTIONS FROM SENATOR CARDIN

Q1. Would national deployment of separate pumps and storage tanks for E15 and other higher ethanol fuel blends provide better prevention against misfueling?

A1. The U.S. Environmental Protection Agency has promulgated regulations to help prevent misfueling with E-15 in vehicles older than 2001 model year and other engines and equipment. EPA has also established additional measures through the EPA-approved misfueling mitigation plans, which should further help prevent misfueling. More information is available online to the industry and others (see http://www.epa.gov/otaq/regs/fuels/additive/e15/e15-mmp.htm). It should be noted that there are currently misfueling events with widely-distributed fuels—including gasoline and diesel—and with sparsely distributed fuels, including E-85. E-85 nozzles and tanks are already separate from the tanks and nozzles that dispense E-10.

a. What are the cost estimates for making such upgrades to our fuel retail infrastructure?

A1a. The cost to install E15-compatible infrastructure today varies widely and depends on the specific situation and number of pumps installed. DOE does not have any costs estimates for installing E15-compatible infrastructure and is not able to validate any of the estimates provided by industry, but provides the following cost information from both the Petroleum Equipment Institute and the Renewable Fuels Association. The Petroleum Equipment Institute estimated the average cost of installing E15 equipment for multiple scenarios and found that a two-dispenser system would vary between about $2,000 and $166,000—depending on the specific existing station equipment, the extent of renovations required, and whether underground storage tanks were replaced/installed. Stations that are just replacing

pumps can do so with modest investment: the Renewable Fuels Association reports that, "the stations that offer E15 today have spent an average of just $10,000 per station to add the product—or slightly less than $0.01 per gallon of gasoline sold." As vehicles built before model year 2001 drop out of inventory and as more automobile manufacturers warrant their new vehicle models for E15 use, there will be less need to have separate pumps for E10 and E15. Similarly, as refueling infrastructure ages and is due for replacement, existing infrastructure can be replaced with E15-capable equipment.

Sources:
http://www.pei.org/portals/0/resources/documents/USDA-letter-e15.pdf
http://www.ethanolrfa.org/news/entry/pei-report-shows-actual-cost-of-installing-e15-is-much-lower-than-claimed/

b. Who should bear the costs of such infrastructure improvements?

A1b. For widespread adoption, fuel marketers will initially pay for any new infrastructure, and over time they would expect to recover this investment from fuel buyers through the sale of the fuel.

c. Is DOE aware of what sort of investment and financial support the ethanol production industry has provided fuel retailers to install these types of infrastructure improvements?

i. If so, how much?

A1c. The U.S. Department of Energy (DOE) is not aware of any subsidy provided by the ethanol industry for installation of E15 storage tanks or fuel pumps. However, a number of states provide incentives. DOE maintains a searchable database of these incentives through its Alternative Fuel Data Center.

d. Should U.S. taxpayers?

A1d. Historically, private investment has built out large-scale infrastructure; this investment is returned through fuel sales. The U.S. Department of Energy (DOE) is not involved in determining the distribution of costs associated with infrastructure upgrades at retail stations. However, DOE has worked with dispenser manufacturers and Underwriters Laboratory (UL) to develop retrofit kits that enable popular dispensers designed for use with E10 to be adapted for use with E15 without compromising UL listing of the equipment. These kits are available from the two major dispenser manufacturers at an installed cost of a few thousand dollars.

Q2. If Butamax technology were deployed onto all of the corn ethanol refineries that it could be retrofit onto, could corn starch-derived fuels make up all of the RFS's volume mandates (aside from the specific volumes for biodiesel and cellulosic biofuels)?

A2. Conversion of corn starch to biobutanol (using Butamax or similar technology) could potentially satisfy a significant fraction of the total renewable fuel volume mandated by the Renewable Fuel Standard. This assumes current yields and factors in an energy equivalence difference between ethanol and biobutanol.

The level of market penetration of this technology would be sensitive to the cost of production for biobutanol and other factors including approval of additional biobutanol fuel pathways (advanced or conventional), blending allowances in gasoline and other such factors.. The focus of the U.S. Department of Energy's research and development activities has been on the conversion of lignocellulosic feedstocks such as corn stover into ethanol and hydrocarbon-based fuels. Our assessment is that the conversion of lignocellulosic-derived feedstocks into biobutanol remains expensive and would likely

not be cost competitive without subsidies in today's fuel market. However, since biobutanol can also be used as an intermediate chemical for the production of higher value co-products, these fuels have the potential to become more economically viable.

a. If corn starch-derived biobutanol were to become the dominant advanced biofuel by 2022, and biobutanol in combination with conventional ethanol, comprised all of the statutory volume requirements under the RFS, and assuming that the existing acres dedicated to corn only increased by 20%, what percentage of our nation's corn supply would be converted into fuel products?

A2a. Our calculations indicate that under these assumptions there would be insufficient volumes of fuel to meet the RFS requirements. This assessment assumes currently observed yields of bio-butanol from corn. If substantial improvements in butanol yield could be achieved through research and development, then butanol could supply a larger portion of the RFS. There is also significant scope for improved yields of butanol from lignocellulosic feedstocks.

Q3. Based on the analysis of the RFS requirement being 36 billion gallons in 2022, what percentage of ethanol would need to be added to gasoline in order to meet the statutory volume requirements by that date?

A3. It is difficult to calculate an exact percentage of ethanol that would have to be blended with gasoline in order to meet the statutory volume requirement of the RFS by 2022. The Energy Information Administration forecasts mid-term energy market consumption and demand trends. These projections are regularly updated and changed due to market influences (e.g. changes in projected petroleum consumption due to the level of economic growth and promulgation of vehicle efficiency standards that result in reduced projected gasoline consumption). The exact percentage of ethanol required to satisfy the RFS in any given date would depend on these factors.

Q4. What is the Department of Energy current program funding to assist in the standup of the advanced biofuels industry?

A4. The U.S. Department of Energy's (DOE's) Bioenergy Technologies Office's FY 2014 enacted funding is $232.3 million, and the Office has requested $253.2 million for FY 2015.

With successful completion of research and development of cellulosic ethanol, DOE's cellulosic ethanol activities are now focused on demonstrating this technology in pioneer commercial-scale biorefineries, with industry providing significant cost share.
Our bioenergy research and development is now entirely focused on "drop-in" biofuels (gasoline, diesel, and jet fuel) that can be competitive with petroleum-based fuels in the market.

With this current focus on drop-in hydrocarbon fuels, the Office is pursuing multiple pathways, including thermochemical-, catalytic-, biochemical-, and hybrid conversion routes for lignocellulosic and algal feedstocks—with the goal of achieving $3.00/gasoline gallon equivalent by 2022 with at least 50% greenhouse gas reduction on a lifecycle basis. Some pathways, such as pyrolysis, are expected to demonstrate their ability to be cost-competitive as early as 2017. Several pilot demonstrations of "drop-in" hydrocarbon fuels—including algae based fuels—are underway within the program as well.

a. Has DOE spent hundreds of millions for biorefining and algae?

A4a. In FY 2014, the U.S. Department of Energy (DOE) Bioenergy Technologies Office's enacted funding is $232.2 million with 66.7% in research and development (R&D) and 33.3% in demonstration activities that include integrated biorefinery facilities at various scales. The majority of the funding is dedicated to R&D in order to increase knowledge in technologies to convert renewable biomass to "drop-in" hydrocarbon fuels and chemicals at reduced cost. After successfully meeting R&D targets for pathways to convert cellulosic feedstocks to ethanol, DOE is completing support for the demonstration of these pathways and similar technologies at scale to reduce technical risk associated with new technology and validate the projected costs.

Over the last decade, DOE has awarded approximately $1 billion in 29 integrated biorefinery projects at three different scales: pilot, demonstration, and commercial.

- 13 plants at pilot scale, roughly processing 1-10 tons of feedstock per day and < 1 million gallons per year to validate laboratory technologies and processes in an integrated but sub-scale demo
- 10 plants at the demonstration scale, approximately 50 tons per day, and 1–5 million gallons per year
- 6 plants at pioneer scale, which refers to first-of-a-kind, commercial-scale demonstration.

DOE's role in demonstration is to help overcome the significant risks with new technologies that the private sector would not be willing to financially bear alone. However, once validated at pioneer scale, industry and the investment community have the necessary technical and economic data to utilize when making further investment decisions.

In 2013, the United States' first pioneer cellulosic ethanol plant at commercial scale, supported by DOE, began production and commercial sale of product. This plant has an annual cellulosic ethanol production capacity of 8 million gallons per year (mmgy). Two additional commercial-scale biorefineries are expected to complete construction and commissioning by the end of 2014. These facilities will add a production capacity of more than 50 mmgy of domestic cellulosic ethanol.

Existing projects in DOE's demonstration portfolio are in final phases; thus, DOE's Bioenergy Technologies Office, which oversees the management and funding of these biorefinery facilities, has requested $105 million in the FY 2015 Congressional Budget Request for demonstration activities. Approximately $35 million will be used to initiate new pilot- and demonstration-scale projects for promising technologies to produce advanced hydrocarbon biofuels. In addition, $60 million of that total is requested to support the intent of the memorandum of understanding signed by DOE, the U.S. Department of Agriculture, and the U.S. Department of Navy through the Defense Production Act activity to fund commercial-scale biorefineries that produce military specification fuels including jet fuel. The remaining $10 million is requested to support understanding of fuel, engines, and infrastructure optimization for mid-level cellulosic ethanol content fuels and hydrocarbon drop-in fuels in collaboration with the Vehicles Technology Office.

DOE's Algae and Advanced Feedstocks subprogram has a multi-year implementation strategy that includes a diverse portfolio of developing algae cultures, improving productivity and yield, improving quantitative and techno-economic analysis of

technology options, and strategically investigating opportunities to accelerate progress towards achieving sustainable algal biomass production and logistics systems. After the 2009 Recovery Act investment of $150 million in algal biofuel technologies (this includes the funding of the research consortium initiative and algae integrated biorefineries), since FY2010 the Algae Program has invested an additional $130 million in new algal biofuel activities (this figure includes the program's recent FY 2014 appropriation of $30 million).

The Algae subprogram and algae-based biofuel projects have continuously produced technology and innovation breakthroughs to help the advanced biofuels industry advance towards commercialization.

b. Does EPA's proposed rule help or hurt the companies you are investing in?

A4b. The U.S. Environmental Protection Agency's (EPA's) proposal seeks to put the Renewable Fuel Standard (RFS) on a steady path forward—ensuring the continued long-term growth of the of the renewable fuels industry while seeking input on different approaches to address the "E-10 blend wall." The U.S. Department of Energy supports the goals of the RFS to increase biofuel production and use because biofuels have an important role to play in increasing our energy security, providing consumers with greater choices, fostering rural economic development, and reducing greenhouse gas emissions from the transportation sector. Through its research, development, and demonstration activities, DOE works in partnership with industry to bring next-generation biofuels on line and aims to transform renewable biomass resources into commercially-viable, high-performance fuels.

Thanks in part to the RFS, the United States produced approximately 13 billion gallons of conventional ethanol in 2012, which directly supported tens of thousands of jobs across the U.S. economy. According to EPA's analysis from the 2010 RFS rulemaking, achieving the goals of the RFS will displace about 14 billion gallons of petroleum fuels in 2030 and reduce greenhouse gas emissions by the equivalent of taking close to 30 million vehicles off the road.

Meeting the targets for cellulosic biofuels has been challenging, but unprecedented progress is now underway, and maintaining the RFS is critical for keeping the 2022 volumetric targets within reach. Availability of feedstocks—such as agricultural waste, municipal solid waste, wood chips, energy crops, and other types of biomass—and developing technologies will help scale up production. Since an advanced cellulosic biofuels industry is now emerging, the RFS provides an important function in guaranteeing a market for these new fuels.

QUESTIONS FROM SENATOR FISCHER

Q1. **DOE has partnered heavily with companies like Novozymes to develop the technology to convert cellulosic biomass to renewable sugars that can be used for advanced biofuels. Indeed, both the Department of Agriculture and the Department of Energy have invested significantly in the biorefinery space. Given that the EPA proposed rule would cut the volumes of renewable fuel in the marketplace, significantly constricting opportunities, where do you anticipate the biorefineries making cellulosic and advanced biofuels coming online will sell their product? Do you anticipate DOE's investment in this area will be affected by EPA's proposed rule?**

A1. The U.S. Environmental Protection Agency's (EPA's) 2014 proposal discusses a variety of approaches for setting the 2014 standards and includes volume ranges for each biofuel category given the level of certainty in developing projections for biofuel use. The 2014 proposal also seeks input on what additional actions could be taken by government and industry to help overcome the blend-wall market challenge and to minimize the need for adjustments in the statutory renewable fuel volume requirements in the future. The proposal seeks to put the Renewable Fuel Standard on a steady path forward and supports the long-term growth and sustainability of the renewable fuel industry.

In fact, EPA's proposed rule would actually increase targeted volumes for cellulosic ethanol, from 6 million gallons in 2013, to 17 million gallons in 2014. Four out of five of the biorefineries that EPA expects to produce cellulosic ethanol in 2014 have been supported by technologies emerging from DOE-funded research and development. These facilities have established off-take agreements for the fuel that they will be producing in the first few years of operation. The investment in these facilities is anticipated to demonstrate the commercial viability of these technologies—reducing the risk for future investments.

RFS is more than an incentive for just ethanol; it includes a wide range of advanced biofuels options that include drop-in replacement fuels, such as renewable diesel. DOE is investing in

research, development, and demonstration for advanced biomass-based hydrocarbon fuel that would be fully compatible with the existing infrastructure, and therefore, avoid challenges associated with the blend wall. Technical breakthroughs and operational best practices—developed through DOE's work in support of cellulosic ethanol—are already being leveraged in the production of these advanced hydrocarbon biofuels, which will also contribute to meeting the goals of the RFS, and enable a broader expansion of the domestic market for biofuels.

In order to continue moving viable technologies from the laboratory to commercialization, DOE's Bioenergy Technologies Office, which oversees the management and funding of the biorefinery facilities, has requested $105 million in the FY2015 Congressional Budget Request in order to initiate new pilot- and demonstration-scale projects for promising technologies to produce advanced hydrocarbon biofuels, as well as to support the intent of the memorandum of understanding signed by DOE, the U.S. Department of Agriculture, and the U.S. Department of Defense through the Defense Production Act activity to fund commercial-scale biorefineries that produce military-specification fuels including jet fuel. Funding would also support understanding of fuel, engine, and infrastructure optimization for mid-level cellulosic ethanol content fuels and hydrocarbon drop-in fuels in collaboration with the Vehicles Technology Office.

Q2. Can you explain the in-depth testing that DOE conducted of E15 in support of EPA's approval of the fuel? For example, I understand that your testing was peer reviewed, and included standardized testing of 86 cars that represented all major vehicle models, which were each operated up to 120,000 miles – or more that 6 million miles in total – to ensure that E15 would not harm a vehicle.

A2. The Department conducted robust testing of the potential effects of E15 and E20 on vehicles and engines. This work included an examination of emissions, catalyst and engine durability, drivability and operability, and materials compatibility and covered both automobile engines as well as smaller engines. The catalyst durability study, which represented about half of the spending, included 86 vehicles driven more than six million miles, used more than 300,000 gallons of fuel, and included about 1,000 emissions tests. A subset of automotive engines (18) was torn down after completion of the testing and no unusual fuel-related damage or accelerated wear was found in those engines operated on E15 or E20.

The primary criterion for new fuel or fuel additive approval specified in the Clean Air Act is whether the candidate fuel damages the emissions control systems of vehicles over their full useful life (currently 120,000 miles). The Department's efforts primarily focused on emissions control durability. DOE's test program used the Standard Road Cycle, a test cycle specified in EPA regulations in the CFR for aging vehicles to full-useful life. Statistical analysis of the test fleet emissions results showed that aging vehicles with ethanol blends did not affect emissions changes over time differently than aging with E0. The Department also conducted studies of the immediate emissions effects, drivability of vehicles, fuel system materials compatibility, and operability and durability of engines.

Senator BOXER. Thank you. In the interest of time, I am going to pass on my chance to question and turn to Senator Cardin.

Senator CARDIN. Thank you very much, Madam Chairman.

As I said in my opening statement, I am a strong supporter of the Renewable Fuel Standards. Mr. Grundler, I listened to your testimony very carefully. And I think you have made the strongest argument as to why Congress needs to act to reform the Renewable Fuel Standard Program. And let me explain and give you a chance to respond.

You indicated the use of the waiver authority was used this year with the proposed change that is out there for comment in which, because of the blend wall, because of the problems of gas consumption in this country and production of fuels, that you need to reduce the overall limits because of the safe use of ethanol-based fuels, although I am somewhat puzzled as to why you also included reductions on the advanced fuels which are not part of the blend wall problem. You may want to explain that.

But my main concern is why EPA did not act in 2012 when there was a request for waiver authority? When corn price hit $8 per bushel and it was clearly affecting our food security in this country. And yet, EPA did not exercise the waiver authority in 2012. You did it this year, and we understand why. I do not understand why you did it for the advanced fuels.

But perhaps you could explain to the Committee why food security issues are not clear enough under the code and do we need to change the code in order to be able to give you the take action in regards to what happened in the food industries?

Mr. GRUNDLER. Thank you, Senator. In 2012, when we received the waiver, requests for a waiver from a number of parties, the circumstances were different. We were suffering from a huge drought which had enormous consequences and damage for many parts of our economy and for our people. We worked very, very extensively with the Department of Agriculture and the Department of Energy and analyzed that situation very, very carefully, sought public comment, did a lot of analysis——

Senator CARDIN. But I am correct that it was 40 percent of the corn that year was used for fuels, 70 percent of the costs in the poultry industry is corn feedstock, I do not want to go through all of you analysis but it seems to me it is pretty clear at $8 per bushel that the demand for corn-based fuels was driving the costs of poultry to an uncompetitive level.

Mr. GRUNDLER. The question before us in 2012, Senator, was whether or not the RFS was causing severe economic harm.

Senator CARDIN. So, therefore, we need to change the statute if we want to protect food security in this country.

Mr. GRUNDLER. Well, that is up to you, I am not here to comment on what Congress should do.

Senator CARDIN. I understand it is up to us. But you do not have the authority to do that under the, as you have interpreted, under the current law?

Mr. GRUNDLER. We have authority to change the standards under a number of conditions. The one condition in 2012 was whether or not the RFS was causing severe economic harm to a

State or the Nation or a region, and our conclusion was that it was not——

Senator CARDIN. And you based that basically on energy costs, not on food costs.

Mr. GRUNDLER. Well, the first question we are trying to answer, Senator——

Senator CARDIN. Yes or no? I mean, I think it is a simple question. I mean, your analysis is based upon the energy sector, not upon the entire sector of this country.

Mr. GRUNDLER. Our analysis was based on whether or not the RFS was, indeed, causing economic harm and we determined it was not because the oil industry was demanding ethanol, would have demanded ethanol with or without the RFS mandate under those circumstances.

Senator CARDIN. I think you have answered the question. Your focus, and I understand that, you have interpreted the code to give you authority to deal with the blend wall issues and the energy issues. And we need to be concerned about the security of this country.

Senator BOXER. Thank you, Senator. Senator Vitter.

Senator VITTER. Thank you. Thank you all for testifying. Mr. Grundler, the EPA's recent use of the waiver authority, I assume that means you all decided that hitting the blend wall was a real threat. Is that fair to say?

Mr. GRUNDLER. We are recognizing that the blend wall has been reached. Correct.

Senator VITTER. Correct. And would you agree that reaching the blend wall threatens a spike in gasoline prices?

Mr. GRUNDLER. I do not know if I would agree with that statement. Reaching the blend wall clearly presents constraints to using more higher-ethanol quantities because of the infrastructure and other market limitations——

Senator VITTER. Because of that. You do not think reaching the blend wall is going to drive costs up?

Mr. GRUNDLER. It is not clear what costs would be driven up. But the infrastructure clearly needs to adapt if we are going to use higher blend walls. And in the space of time between now and 2014, we did not think that it would be feasible to use the amount of ethanol that the Congress required in 2014.

Senator VITTER. And so, therefore, without a waiver, are prices not going to go up?

Mr. GRUNDLER. We determined that it was simply not feasible for the system to absorb that much ethanol. It is not clear if the prices would go up or what choices the market would make——

Senator VITTER. Is your recent action based on the waiver authority a temporary or a permanent solution?

Mr. GRUNDLER. We are exercising our waiver authority for 1 year as we set the 2014 standard.

Senator VITTER. Would you expect that action this year to be a long-term solution?

Mr. GRUNDLER. Well, what has been lost in a lot of the debate since we made our proposal, Senator, is the methodology that we are seeking input on, which provides a forward looking path to ad-

dress both the realistic constraints that the current market conditions impose as well as providing the long-term growth over time.

Senator VITTER. I do not know what that means, so let me reask the question. I am simple, I guess. Would you expect the action you took this year to be a permanent solution not requiring subsequent actions in subsequent years, whether legislative or administrative?

Mr. GRUNDLER. Sir, the law requires us to establish volume requirements each year. So, in 2015, based on the methodology we are proposing, we would be proposing the volume standards for 2015. And our methodology would take into account what is the reasonable amount of ethanol that can be used in this country in 2015. We will make that determination as we propose the 2015 standards.

Senator VITTER. OK. Is there not a very strong possibility that your actions, once finalized, will be litigated?

Mr. GRUNDLER. Well, I would hate to speculate, but certainly there are, people have been suggesting that.

Senator VITTER. OK. If that happens, that would certainly perpetuate or increase uncertainty, is that fair to say?

Mr. GRUNDLER. Yes.

Senator VITTER. OK. A final question. On the cellulosic biofuel side, what was produced and available for compliance under the RFS in 2010, 2011, 2012 and so far in 2013?

Mr. VITTER. So far in 2013 we expect that the biomass-based diesel production will reach between 1.6 billion and 1.7 billion gallons. Last year, I think it was closer to the standard level, 1.28——

Senator VITTER. We are talking about cellulosic biofuel?

Mr. GRUNDLER. I am sorry, I thought you said biomass-based diesel. Cellulosic biofuel, our proposal is for 17 million to be produced, that it what our estimate is for 2014. For 2013 the standard is 6 million gallons and I do not——

Senator VITTER. So, is your current estimate that that can be produced?

Mr. GRUNDLER. In 2013?

Senator VITTER. Yes.

Mr. GRUNDLER. Yes.

Senator VITTER. And just a final thought. Compared to that, what was the statutory mandate for 2013?

Mr. GRUNDLER. For 2013, it is 2.75 billion for advanced, for cellulosic it is what? 2.75 billion, sir.

Senator VITTER. For cellulosic I think it is 1 billion. Does that sound right?

Mr. GRUNDLER. I am sorry, which, for 2013?

Senator VITTER. Cellulosic biofuel for 2013.

Mr. GRUNDLER. For 2013, 1 billion, yes.

Senator BOXER. Thank you, Senator. We have to move.

Senator VITTER. Pretty significant gulf——

Senator BOXER. We have to move on, Senator. Senator Merkley.

Senator MERKLEY. Thank you, Madam Chair. And I wanted to continue the conversation on cellulosic. I have the EPA's Federal Register analysis and it shows that there are five groups that are coming online with commercial cellulosic ethanol in 2013, 2014. But the estimates read, for the first plant, 0 through 18 estimate,

second plant, 0 through 2, the third, 2 through 5, then 0 through 9, 0 through 6. In other words, they are coming online but the estimates are still 0 through something.

Why is there so much uncertainty over what the plants, especially since at least one of them came on in 2013, two of them did actually, why is there so much uncertainty that they might actually produce no cellulosic ethanol?

Mr. GRUNDLER. Well, sir, this is a new business. This is new technology. And as my colleague mentioned, there has been an enormous amount of research and development. But going from a laboratory to a pilot scale to commercial scale is challenging, and it is difficult and there are startup problems. And that is why we see such a broad range of values in our estimates.

Senator MERKLEY. So, even for the plants that got online in 2013, it is still very uncertain whether they can reach their commercial design potential in 2014. OK. That is helpful. You are just kind of dropping the goal into the middle. In other words you estimate currently that the companies with approved pathways can produce 8 to 30, and so you are saying well, somewhere in the middle is 17 so we will toss it in there. Well, where does the 17 come from?

Mr. GRUNDLER. Sir, it is a little more sophisticated than that, I am pleased to say. We actually do what is known as a Monte Carlos Analysis where we try to look at the probabilities and select a mean based on what the most likely scenario is.

Senator MERKLEY. So, let us compare that, say, to what was actually produced in 2013. Do you have a sense of how many million gallons actually were produced commercially?

Mr. GRUNDLER. Well, we are still counting, sir. Our standard is 6 million. I do not know if we have an estimate. We do not have a final number now. It is in the hundreds of thousands of gallons that have been produced so far.

Senator MERKLEY. So, the 17 still represents a considerable draw forward in terms of encouraging the market. The reason I am raising this question is you have all of these plants and their potential production for next year is significantly above 17, and you have investors who have based their investments on the understanding that if the fuel is produced, they will be a purchaser. And so I am wanting to make sure that we are not aiming for a mark here that essentially leaves this whole effort stranded.

Mr. GRUNDLER. I understand the question, sir, but under the law, and we have got recent guidance from the courts, that we have to base our projections on a neutral estimate of what can actually be produced in the future year and we are being fairly conservative.

Senator MERKLEY. I want to turn to, in the 50 seconds left, to questions about corn ethanol when it is produced on new agriculture land that essentially is being plowed because of the production of corn. When you look at the life cycle analysis of the impact of additional acreage, the fertilizers, the tractors and the carbon released from the disturbance to the ground, is there actually a CO_2 advantage to producing that extra acre of corn?

Mr. GRUNDLER. Sir, that is a very complicated question. It really depends on how the corn is being produced, how the ethanol is

being processed, and we see a wide range of efficiencies in corn ethanol production today. To be counted as renewable biomass, it has to come from land that has been previously cultivated. So, the Congress established essentially two different bins, if you will, of biofuel and most of today's corn production was grandfathered and does not need to meet the greenhouse gas thresholds of 20 percent. But when we set the standard——

Senator MERKLEY. My time is up. So, I'm going to stop you right there and I will look forward to continuing the conversation. Thank you.

Mr. GRUNDLER. Thank you.

Senator BOXER. Thank you, Senator. Senator Fischer.

Senator FISCHER. Thank you, Madam Chair.

At this time, I would like to ask if I could have included in the record a letter from the Renewable Fuels Association.

Senator BOXER. Without objection.

[The referenced information follows:]

RFA RENEWABLE FUELS ASSOCIATION

December 11, 2013

The Honorable Barbara Boxer
Chair
Committee on Environment and Public Works
U.S. Senate

The Honorable David Vitter
Ranking Member
Committee on Environment and Public Works
U.S. Senate

Dear Chair Boxer and Ranking Member Vitter,

The impact of the Renewable Fuel Standard's RIN (Renewable Identification Number) credit program on gasoline and ethanol markets is certain to emerge as a topic of discussion at the Committee's December 11th oversight hearing on domestic renewable fuels. Therefore, I am writing to provide additional perspective on the importance of a viable RIN market to future growth in domestic renewable fuels production, and to correct prevalent misconceptions about the influence of RINs on consumer fuel prices.

In essence, a RIN is a unique "serial number" that commemorates the production of one gallon of ethanol. The RIN is attached to the gallon of ethanol at the point of production and generally remains affixed to the gallon throughout the supply chain. Thus, when a blender or refiner purchases a gallon of ethanol, it is also receiving the attached RIN *(at no additional cost)*. The RIN is separated from the gallon when the ethanol is physically blended with gasoline by an obligated refiner or blender. At this point, the RIN becomes an instrument for demonstrating compliance with annual RFS blending requirements; the obligated party ultimately surrenders the RIN to the Environmental Protection Agency (EPA) to prove that the blending requirement was satisfied.

Importantly, RINs have a two-year compliance life and may be banked or traded to other parties. As such, if an oil company blends more ethanol than is required by its respective renewable volume obligation (RVO), it obtains more RINs than are needed and it may sell them to other obligated parties who blended less ethanol than required. EPA developed a moderated trading platform to facilitate the transaction of RINs amongst obligated parties and other RIN owners.

In addition to providing compliance flexibility for obligated parties, *the RIN system was expressly designed to stimulate investment in expanded renewable fuels production and distribution capacity*. As renewable fuel blending requirements approach or exceed perceived market barriers such as the 10% ethanol (E10) "blend wall," demand for detached RINs for compliance will increase and, naturally, prices will rise. When RIN prices are lower than the equivalent cost of installing high-level ethanol blend infrastructure, obligated parties will purchase RINs on the open market to cover blending obligations above the E10 "blend wall." But as demand for RINs increases and prices rise, rational obligated parties will, at some *sustained* price point, find it more economical to invest in the infrastructure necessary to distribute high-level ethanol blends than it is to purchase RINs on the open

market. As explained by Iowa State University Economics Professor Bruce Babcock, "The cure for high compliance costs is investment in E85 and E15 infrastructures, which, in turn, would allow for the higher future biofuel consumption levels that are envisioned in current policy."[1]

As part of their ongoing effort to undermine the RFS and cloud the debate over the program's benefits, oil companies have suggested that higher RIN prices translate into higher fuel prices for consumers. However, there is absolutely no evidence to support this claim. Data clearly indicate that higher RIN prices in 2013 did not have any discernible impact on gasoline prices. Retail gasoline prices in 2013 followed the same seasonal pattern as in previous years but actually showed *less* seasonal volatility than in the previous two years (Figure 1, attached). Further, the relationship of retail gasoline prices to crude oil prices (as measured by the difference between retail gasoline prices and Brent crude oil prices) was also historically normal (Figure 2). This indicates there was no refiner "markup" of gasoline prices to offset RIN "costs." Finally, there was no correlation whatsoever between RIN prices and retail gasoline prices in 2013; in fact, there were many instances during the year when gasoline prices were falling as RIN prices were rising, and vice versa (Figure 3).

There are simple explanations for the disassociation of gasoline prices and RIN prices. First, RINs are primarily traded in a "closed loop" market amongst parties in the gasoline supply chain. That is, a party buying a detached RIN will incur an additional cost, but the counterparty selling the RIN will simultaneously incur a profit. In this manner, one party's RIN expense is exactly offset by the counterparty's RIN revenue, and the net effect is no impact to the consumer. Second, the gasoline market is highly competitive and market actors are compelled to match, or undercut, the wholesale selling prices of their competitors. Thus, a refiner who has purchased RINs on the open market cannot markup the selling price of its gasoline to recoup RIN expenses if it wishes to remain competitive with other refiners who profited from the sale of detached RINs.

In short, there are winners and losers in the RIN market, but because the system is essentially a closed loop, retail gasoline prices are unaffected. A number of refiners and blenders substantiated the "zero sum" nature of the RIN market in financial earnings statements.[2] In addition, an official with the Energy Information Administration recently confirmed the absence of any connection between RIN prices and retail gasoline prices, stating, "To date, there is no evidence that retail gasoline prices have been affected by high RIN prices. While the cost of refined gasoline blendstock can be affected by high RIN prices, the increased cost to gasoline blenders is almost exactly offset in 2013 by their increased revenue generated from the sales of RINs separated when they blend ethanol into gasoline."[3]

In fact, there is evidence that higher RIN prices actually led to *lower* fuel prices for consumers of high-level ethanol blends in the summer of 2013, when RIN prices were elevated. Progressive fuel blenders and retailers purchased ethanol (with free RINs attached), blended it to make E85, separated the RINs from the gallons, and sold the RINs to refiners who had stubbornly chosen to buy RINs rather than physical gallons of ethanol. Thus, the revenue from the sale of the RIN allowed enterprising retailers and marketers to reduce the price of the E85 for the consumer. In many cases this spring and summer, E85 was priced at a 25-35% discount to regular E10 gasoline. In response to these discounts,

---

[1] http://www.card.iastate.edu/policy_briefs/display.aspx?id=1212

[2] See a summary of refiner and blender earnings statements regarding RINs at http://www.ethanolrfa.org/exchange/entry/what-do-big-oils-quarterly-earnings-say-about-the-real-impact-of-rins-on-u/

[3] Presentation by Mindi Farber-DeAnda, EIA Office of Petroleum, Natural Gas, and Biofuels Analysis to Advanced Biofuels Association. November 20, 2013. Washington, D.C.

consumer demand for E85 increased dramatically. Data from the Minnesota Department of Commerce, for example, show that E85 sales nearly doubled from April to May as RIN prices increased (Figure 4). Additionally, the emergent E85 value proposition, enabled by RINs, has driven retailers to install an estimated 200 new E85 pumps since the beginning of the year.[4] Indeed, E85 prices, sales volumes, and infrastructure development during the summer clearly demonstrated that the RIN mechanism will work exactly as intended to drive expansion of renewable fuel consumption and investment.

Unfortunately, EPA's recent proposed rule for 2014 RVOs—which includes substantial cuts to statutory blending requirements—has halted the transformation of the liquid fuels marketplace just as it was getting started in earnest. EPA's proposal greatly diminished the economic incentive to invest in high-ethanol blend infrastructure and has impaired the ability of retailers to offer E85 at steep discounts to E10. By adopting the oil industry's "blend wall" concept, EPA's proposal emasculates the RIN mechanism and totally eliminates the means of driving investment in expanded renewable fuel production and distribution infrastructure.

In light of these facts on the RIN market, we hope the Committee will join the biofuels industry in encouraging EPA to finalize a 2014 RVO rule that reinvigorates the RIN market and restores the incentive to expand renewable fuel distribution capabilities. Our message is simple: let the RFS work and let the RIN market function as intended. Failure to do so will permanently alter the course of the RFS and will only solidify our nation's dependence on carbon intensive fossil fuels.

Please do not hesitate to contact me should you have questions or comments regarding the contents of this letter.

Sincerely,

Bob Dinneen
President & CEO

[4] E85prices.com

Figure 1. U.S. RETAIL GASOLINE PRICES (REGULAR GRADE)

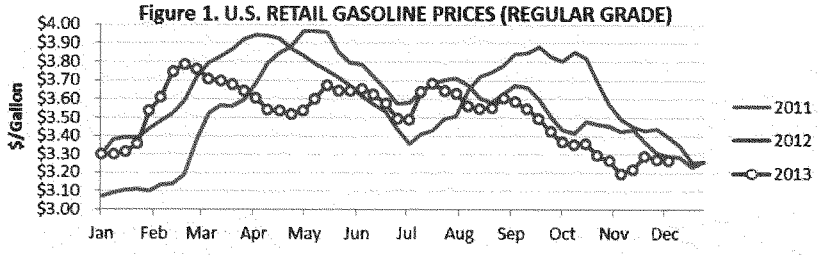


Figure 2. RETAIL GASOLINE - BRENT CRUDE OIL SPREAD

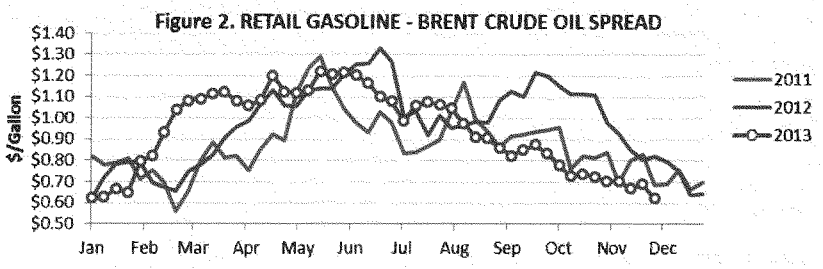


Figure 3. WEEKLY U.S. RETAIL GASOLINE PRICES AND DAILY RIN PRICES

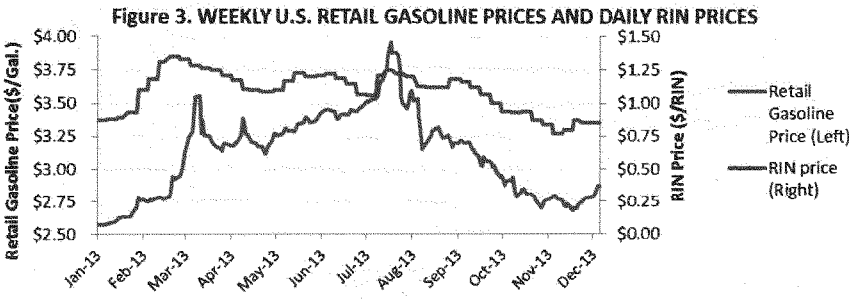
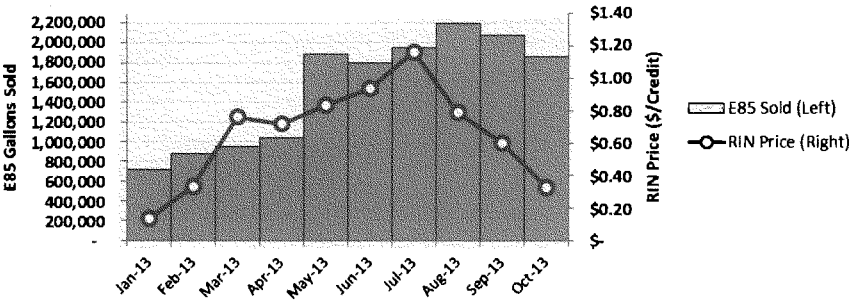


Figure 4. MINNESOTA E85 SALES vs. RIN PRICE



Senator FISCHER. Thank you very much.

Mr. Grundler, the EPA's proposed rule establishing the RVOs for 2014. Your analysis supporting this proposal includes consideration of the availability of infrastructure in setting the volumes and it indicates that you plan to use this same approach in your rulemakings for the next several years. Is that correct?

Mr. GRUNDLER. Yes, Madam.

Senator FISCHER. OK. Given that infrastructure and investments are motivated by anticipation of more fuel entering the marketplace, not less fuel, how do you believe that your proposal is going to incentivize the installation of the infrastructure necessary to allow for the deployment of higher blends?

Mr. GRUNDLER. In a number of ways. And, of course, the Renewable Fuel Standard is more than just about one kind of fuel. It certainly is about corn-based ethanol but the priority that the Congress set is for most of the growth in the future it is about these advanced biofuels that we have been talking about. And with respect to, for example, ethanol from these advanced sources like cellulosic, they get their own standard which is essentially walled off by the law.

So, our cellulosic standard going into the future will be based on our estimate of what can actually be produced in that next year. And as my colleague from DOE described, there has been an enormous amount of progress in terms of the technology and its efficiency and its ability to produce these higher volumes.

As for the market conditions that would incentivize more infrastructure, we are seeing that today and in fact, our proposal does imagine a volume that is above the blend wall. We are anticipating more E85 being sold next year than is being sold this year. And our estimates are based on that trend line and that pace of new E85 stations being built.

Now, of course, we provide a range and we are asking for more information and data on whether or not we got that right or if we are being too conservative. I can tell you, having sat through 13 hours of public testimony last week, that we got a very wide diversity of views and many people thought we got it wrong and that we had adjusted it too far. Others told us we did not adjust it enough. And a few people said we got it about right.

So, what we emphasize at the hearing is please give us updated information on sales, on infrastructure, on our assumptions so that we can make the best decision we can with that information before we go final.

Senator FISCHER. Earlier in your comments to Senator Cardin you said that the oil industry has a demand for ethanol. Could you continue then and say that there is an economic value of ethanol for the oil industry?

Mr. GRUNDLER. Oh, without a doubt. The whole petroleum industry infrastructure has optimized around this 10 percent blend. It does have a value in terms of enhancing the octane of the gasoline as well as a volume extender up to a point.

Senator FISCHER. You also mentioned that, when you talked about the blend wall, that reaching that blend wall does not necessarily drive up gas prices. Did I hear you correctly on that?

Mr. GRUNDLER. What I said, what I meant to say, certainly, is that is a very complicated equation. And so, it is not clear to me exactly what the impact would be and what the incremental marginal costs are for going above that blend wall. That is what we are trying to do in this proposal. We are trying to estimate what is the reasonable amount of higher-blend ethanols that today's market and infrastructure can in fact——

Senator FISCHER. And you would say, my time is up, but you would say that gas prices fluctuate on a number of inputs, and I guess I would say ethanol would be a very small part of that. Would you agree with that?

Mr. GRUNDLER. I would agree predicting gasoline prices is treacherous, and we try to avoid it.

Senator FISCHER. Thank you so much. And thank you, Madam Chair.

Senator BOXER. Senator Whitehouse.

Senator WHITEHOUSE. Thank you, Madam Chair. I just have one question, and that is where you got your biomass-based diesel requirement? If you look at cellulosic biofuel, I have U.S. commercial production for that in 2012 as just over 20,000 gallons as compared to the Energy Independence and Security Act estimate that it would be 500 million gallons. Well, 20,000 is a long way from 500 million, and you all have adjusted your volume requirement for cellulosic biofuels as a result.

So, then you switch over to biodiesel, and my information is that the biodiesel industry has produced over 1.7 billion gallons just this year. And EPA proposes to set the 2014 biomass-based diesel at 1.28 billion gallons, which is a, the same as the 2013 requirement, no change, and b, less than what I understand is already being produced by the industry.

What is the logic to that? Why did you not make an adjustment reflecting the industry output for biodiesel the way you did for cellulosic?

Mr. GRUNDLER. Thank you, Senator. That is a very good question.

Senator WHITEHOUSE. Well, it is a pointed question because it will hurt businesses that are out actually doing this if you do not have this right.

Mr. GRUNDLER. The requirements under the law for setting the cellulosic standard and for setting the biomass-based diesel standard are different. That is the short answer.

You are right that we are keeping the standard the same. The law does not require us to increase the biomass-based diesel standard from year to year. I would note that this year the standard was 1.28 and the industry over-achieved for a number of reasons relating to the market and to tax policy. So, projecting into next year, there are a number of uncertainties as to what those market conditions will be.

But we look at the 1.28 standard as a floor. And when we constructed our advanced standard, which the biomass-based diesel standard is a part of, we did consider this broader range up to 1.6 billion. And we made a policy choice that biomass-based diesel can compete within that advanced standard for that additional volume, just as they did very effectively this year.

Senator WHITEHOUSE. All I can tell you is that for the folks in the industry who I talk to, they do not see it as a floor, they see it as a target and as a number kind of around which the industry does not actually coalesce but it has an impulse in that direction anyway. And when you set it below existing levels, it seems to them that you are sending a message saying that what you are doing out there, despite all of the value of this biodiesel, is not worthwhile and we want less of it, we want to get back to a target of 1.28 billion.

So, you need to make it a lot clearer your notion that this is a floor because I have never heard anybody express that until this moment.

Mr. GRUNDLER. Thank you. And I heard directly from your constituent at the public hearing, one of the Rhode Island biodiesel producers, and heard that perspective. And we are specifically asking for comment on this question and did we consider the factors right and should we consider a higher standard specifically for biomass-based diesel and we are going to be looking forward to that information.

Senator WHITEHOUSE. And if the biodiesel tax credit expires at the end of the year, if we cannot fix the tax extender problem which we have frequently failed at doing, this would then be the only market incentive remaining for that industry. Correct?

Mr. GRUNDLER. I would not say it is the only market incentive because there is this RIN market which provides a value to biomass-based diesel. But our standard is based on the assumption that the tax credit is expiring.

Senator BOXER. Thank you, Senator. Senator Inhofe.

Senator INHOFE. Thank you, Madam Chairman. Luke, put up that blue chart, will you? I think Senator Whitehouse, Senator Cardin and Senator Fischer, all of them are asking kind of the same thing and I hesitate to get into that, but I think it is something that really is not understood. Now, if you were talking about something that we had a mandate that was five times or two times or even ten times what the standard would finally be, that would be of more understanding to me.

This chart though, this chart shows that the blue, I say to my friend Senator Sessions, is that is the requirement spaced out over the years, all the way to 2022. And yet the anticipated projection of the availability of cellulosic is that red line that you can hardly see down there.

And you know, I just wonder, what would be wrong with putting in legislation that had something that kind of referred to the total mandated amount cannot exceed say 2 to 1 over the previous year or something like that. What is your thinking on that? I mean, we are so far off here. I have a hard time explaining to people back home why I sit on this Committee, and at one time chaired this Committee, and we still have that disparity between mandates and availability.

Mr. GRUNDLER. Well, I think Congress anticipated this possibility which is why it gave the Administrator the ability to waive the standard in circumstances——

Senator INHOFE. Yes, but that far off? Now I could understand that, you know, being off 2 to 1 or 3 to 1, but to me they are pass-

ing something that does just the opposite. It allows the EPA to make a determination with no limit because the limit right there, look, you can see by the blue line, that is the reasoning, you give them the flexibility.

Mr. GRUNDLER. My eyes are getting old but I think what you are describing as the limit are the statutory targets that were written into the law.

Senator INHOFE. Yes, there we go. And that law should be repealed, I believe. Do you think it should be repealed?

Mr. GRUNDLER. I do not have an opinion on that, sir, as you well know.

Senator INHOFE. Let me mention one thing because you brought up the RINs, and that is kind of interesting because we went through this for 12 years now on cap and trade, and that is essentially what we are talking here, because you are allowing a system in place that would make up for the disparity. At least, this is what I see. And when I say that, I think it is interesting because that has been rejected for 12 years and there probably is not a third of the votes that would be supporting it. Just a concept.

Do you see that there is any relationship between that program and the RIN Program, how that is working? The RIN started out at what? One or two cents? And they have gone up at high as $1.20. What do you think industry is thinking out there not knowing what that price is going to be with a disparity like that? Does that concern you?

Mr. GRUNDLER. Well, I think most observers in this space anticipated a rise in the prices as this so-called blend wall was approaching and that is, indeed, what happened. They have fallen substantially since then. I do not see the connection that you are making though between the RIN market and cap and trade.

The RINs were developed, by the way, in collaboration with the industry as a flexibility tool and as a means to measure compliance, and I think they have worked pretty effectively at doing that. The alternative would have been to force every refiner to blend every gallon of gasoline they produce with ethanol. This flexibility allows people to make choices in terms of how they reach the compliance.

Senator INHOFE. Well, I think it is, and maybe it helps to make choices, but when you have a variable as we have in the RIN prices, I think that makes it more difficult for industry. Just a thought.

You know, Mr. Grundler, I am not blaming you for this. It is something you kind of inherited and it is something you are dealing with and it is not easy. So, I have sympathy for you. But I think on this side of the table we should be looking at legislation so that we do not have the problems that Democrats and Republicans are all united in being concerned with.

Thank you, Madam Chairman.

Senator BOXER. So, I am going to now turn to Senator Udall.

Senator UDALL. Thank you, Madam Chair. And Mr. Grundler, thank you for your work at EPA.

Can you tell me more about EPA's ability to meet the statutory deadline for finalizing RFS volume requirements each year by the end of November? EPA missed the deadline for 2013 by over 9

months, the agency is only now proposing requirements for 2014, again missing the deadline.

And regardless of which side of the many sides to the RFS debate someone is on, it seems like something we can all agree on is that EPA needs to reliably perform its role to enable this policy. Uncertainty is a significant challenge to the outcome. What assurances can EPA give this Committee that they will finalize the volumes on time in the future?

Mr. GRUNDLER. Do I get credit for proposing the 2015 standard ahead of time?

[Laughter.]

Senator UDALL. Well, if you do it on time that would be nice, yes.

Mr. GRUNDLER. Well, we have proposed the 2015 standard last month for biomass-based diesel, Senator.

I am not proud of our record here. I would like to be faster. The truth is that this has been a very challenging policy issue with a lot of diverse points of view as I heard last week and as we have heard today. This renewable fuels policy intersects with a lot of different parts of the Government, a lot of different kinds of policy beyond environmental policy, and that has made it challenging.

I am hopeful, and our goal is certainly to finalize these 2014 and 2015 standards by this spring and hopefully get back on track. Our whole intention here with this proposal is to put the RFS on a more manageable trajectory that provides for both growth over time of these fuels as well as recognizing the pace at which the market can respond to use them. And if we get it right, then perhaps the temperature will drop and people can unite behind our approach that we are laying out.

Senator UDALL. Great. Thank you for that commitment.

Mr. Chalk, thank you for your work at DOE.

In your remarks today, you mentioned that one of DOE's R&D goals was for cellulosic drop-in fuels. Can you tell me if there are other similar targets for algae drop-in and advanced biofuels which DOE is pursuing in fiscal year 2014, what challenges do algae R&D focus on, and what can innovators working in New Mexico, how can they partner with DOE to continue to work on these critical challenges in the future?

Mr. CHALK. Thank you for that question, Senator. We are looking at cellulosic and advanced biofuels as well as algae. So, we are really neutral on the feedstock. All the feedstocks are non-food sources. So, we would include algae toward that goal if it can achieve that.

We view that as a little longer-term pathway, but certainly we have three pilot demonstrations right now that are making very, very good progress toward that goal. So, we see the algae pathway as very important to achieving drop-in fuels which really get around this blend wall issue that we have because they are totally compatible with the infrastructure today.

Senator UDALL. Great. I yield back, Madam Chair.

[The prepared statement of Senator Udall follows:]

STATEMENT OF HON. TOM UDALL,
U.S. SENATOR FROM THE STATE OF NEW MEXICO

Good morning. Welcome, Mr. Grundler and Mr. Chalk, and our other distinguished guests serving on our second panel.

Thank you for being here today. And Senators Boxer and Vitter, I want to thank you for holding this hearing on renewable fuels.

This is an important discussion. I have long said we need a "do it all, do it right" energy policy. Taking control of our energy security. Producing more energy here at home. And using a diverse portfolio of sources.

How we manage to do this will have a huge impact. To our planet. To our security. And to our economy.

The threat of global warming is real. That is not conjecture. That is science. The reality is we have to transition to a clean energy economy. This is a commitment we owe future generations. And it is a commitment that will not wait.

So, we have to make that transition. And our goals are clear. To meet our energy needs. To reduce the impact of energy production on the environment. And to drastically cut the pollution of our air and water.

Renewable fuels play an important role. For increased domestic energy production. For a sustainable energy mix. Moving our country and our economy forward in the future.

Overall we are making progress. Market share of renewable fuels has increased. We've seen many success stories. Applying American innovation to meet our energy challenges.

In my State of New Mexico, there are multiple examples of how innovation is successfully implementing solutions.

Sapphire Energy is one example. Using algae feedstocks for green crude oil that flows with conventional crude oil all the way to the refinery for processing.

Another company, Joule Unlimited, produces fuels directly and continuously from sunlight and waste CO_2 in a novel, gas-to-liquid conversion process.

And in both cases the end product is indistinguishable from conventional fuel.

Our State also leads in biofuels research and development. Just last week I saw firsthand how important the R&D efforts of Los Alamos National Lab, the New Mexico Consortium, and each of their university partners, including UNM, NMSU, and NM Tech, are for the future of this industry.

I am concerned that the proposed changes to the RFS could jeopardize near and long term growth in advanced biofuels, preventing innovative technologies in New Mexico from entering the pipeline for future production.

We need the RFS to enable all these innovative fuel sources to develop side by side with conventional fuel.

There are some areas where we can do better. First, the EPA rulemaking process needs to perform more reliably. When it does not, innovation is stifled. Business opportunities fall through. Investments fail. There is too much uncertainty. We need to change that.

Second, we need to be more feedstock neutral. It shouldn't matter whether the source is corn or algae. What matters is the final product. That fuels our economy. And that creates jobs.

The RFS should do more. To push innovation and technology in the market. With advanced biofuels that are indistinguishable from conventional ones.

In 2011, I introduced a bipartisan bill to level the playing field for advanced biofuels and to make the RFS more technology neutral.

The current RFS includes a traditional ethanol standard of up to 15 billion gallons by 2015. That comes mostly from corn feedstock. Which is linked to the price of cattle feed.

I am concerned that this drives up prices for dairy producers in New Mexico, who for years have been struggling to break even because of inflated feed cost.

And beef producers who have seen their herd size cut in half from several years of drought, limited forage, and rising feed costs.

To address this issue, we can rely more on advanced biofuels.

The large majority of the advanced biofuel standard is limited to only cellulosic biofuels. The playing field remains uneven. Other biofuels like algae remain at a disadvantage.

We should change that. And we can, by removing the cellulosic biofuel carve-out and creating a technology neutral category. One that would include all advanced biofuels. Cellulosic. Algae. And other technologies, all at the same 21 billion gallon standard by 2022.

That RFS will reward innovation, provide opportunity for growth, and help us develop the diverse sources of energy that we need for the future.

I am looking forward to hearing more from today's panels.

Senator BOXER. Thank you very much. Senator Sessions followed by Senator Boozman, and then we are going to move right to the second panel.

Senator SESSIONS. Well, to follow up on Senator Inhofe's question, I supported the law that we would have cellulosic mandates, and we thought we would have some things happening that were going to develop that would give us a realistic opportunity to meet those goals. But that law required that there be 16 billion gallons by 2022. And as the chart showed, EIA, your own Department of Energy Information Agency, says we are only going to have now, they are projecting, half a billion gallons by 2022.

So, that represents a reality that we are going to have to deal with and you have indicated, and I have looked at algae projects and seen some up close, but that is a long way off. We are not going to fill this gap with algae by 2023 are we, Mr. Chalk?

Mr. CHALK. Thank you for the question, Senator. I would like to first start with what the status of cellulosic ethanol is. As I said in my testimony, we brought the cost down by a factor of four. The research and development is completed on that.

Senator SESSIONS. Well, let us ask—Range Fuels in Georgia, is it still operating?

Mr. CHALK. No, it is not.

Senator SESSIONS. It is closed. It was supposed to be the brightest prospect for a long time, was it not?

Mr. CHALK. Yes, Senator.

Senator SESSIONS. And then there was one in Alabama that was sued for fraud. And now you have got KiOR in Mississippi that has some potential, I think. Is that correct?

Mr. CHALK. We see a lot of potential.

Senator SESSIONS. Do you see anything better than, say, the KiOR technology out there that is going to have a potential to fill this gap?

Mr. CHALK. Yes. There are five bio-refineries currently in the early stages of commercialization. We see great promise for the industry to expand. As Senator Boxer said in her testimony, when we started these efforts in the 2007 and 2008 timeframe, private investment was very hard to come by. So, a lot of these plants were delayed until that private cost share could be secured. And now we are in really early commercialization phases for cellulosic ethanol and we expect a very fast ramp up.

Senator SESSIONS. Now, Madam Chair, for example, you harvest timber in Alabama and, I think, in most places, you have 10, 20 percent of the tops that are waste products that a farmer would be glad to have taken away. He would not have to be paid for it because it impacts his ability to replant and start over again. But that is limited, too.

I guess what I am saying is I guess we probably overreached. Can you give us, can you give us realistically a specific kind of cellulosic productivity that can be achieved? And I will end with this. I think we would be smarter to help assist the technology development than to issue mandates before we have technology capable of meeting the mandates.

So, we mandated cellulosic that we had no proven technology from and that has caused, really, an embarrassment to us all. So, give us your prospects of what might happen with cellulosic because it would be great if we could do that, it does not require

breaking up new land and farming in the way that might otherwise be the case.

Mr. CHALK. The department commissioned what we call the Billion Ton Study so, if you include all the agricultural residue and wood waste and other sources, we could potentially replace about one-third of our transportation energy. And we are committed to the RFS and this process, and the checks and balances that Congress provided in the law and the process that EPA is going through right now where they are looking at what is the capacity of the industry to provide these fuels is very good. We think it is going to result in a final rule that will maintain the strength and the promise of the RFS.

We think the long-term predictability of the RFS is critical to maintain this investment.

Senator BOXER. I am going to have to stop you right there even though you are making a really good point. We have to move on.

Senator BOOZMAN. Thank you, Madam Chair. And I know that we do need to go to the next panel.

Mr. Grundler, again, is it my understanding that your testimony is that if we hit the blend wall substantially that the price of diesel would not go up significantly?

Mr. GRUNDLER. I did not make that statement. I do not have an estimate for you. But the truth is that we have hit the ethanol blend wall.

Senator BOOZMAN. But most people feel like that would be the case. That is a fair statement, is it not?

Mr. GRUNDLER. No, I cannot confirm that statement. There are a lot of economists that are looking into that.

Senator BOOZMAN. I guess it is important that you would figure that out.

Mr. GRUNDLER. OK.

Senator BOOZMAN. In the sense, you know, that that really is a huge issue.

Mr. GRUNDLER. Could I respond? If I could just respond? What we have done in our proposal is we are, actually the blend wall has been reached, we are making an estimate of what is a reasonable amount of ethanol that can be consumed by the current system as well as what advanced biofuels can be produced in providing that estimate. So, I think the methodology that we proposed and the comments that we are seeking does address this concern that some have laid out with respect to the economic impacts of this blend wall.

Senator BOOZMAN. No, and again, do not misunderstand. I agree with what you are doing. I think that is good. Let me ask you about the RINs in the sense that there is being fraud associated with that and things.

Mr. GRUNDLER. Yes, sir.

Senator BOOZMAN. This is a different thing than EPA, it is a different situation than they normally deal with. Can you comment about that, about the fact that there has been some fraud, what the agency is doing to prevent that in the future? I know you are in the process of a rulemaking that has not been complete. Maybe you can comment real quickly on when that will get completed.

Mr. GRUNDLER. Yes, that rulemaking has been proposed. We got an, again, an enormous amount of comment on our proposal which establishes a voluntary quality assurance approach so that people have confidence in the RIN market and it creates the kind of liquidity that we need.

The rulemaking will be finalized early next year and we believe that already, because the way we wrote the proposal, allowed for some of this quality assurance to happen during this transition period and that we are very pleased to see that one of the concerns was that small producers would be going out of business. That has not happened. The number of producers is about the same. People are taking advantage of these quality assurance vendors. And liquidity in the marketplace has been restored.

Senator BOOZMAN. Thank you. I have got to leave. I do want to recognize General Clark for being here as a fellow Arkansan. We are very, very proud of him for his service to his country in a number of different ways.

Thank you, Madam Chair.

Senator BOXER. Thank you very much.

So, we are good. I passed on my questions so I am going to make three statements. If you disagree with me, I want you to say so. And then we will close out.

One, oil companies need ethanol. Two, some oil companies even produce ethanol. And three, if Congress were to set a limit every year on how much alternative fuels we would need, I believe that would be a disincentive to the development of these alternative energies. Do either of you disagree with anything I said? That is great. Oh, you had a momentary thought there.

I really do appreciate this very, very much. I know we rushed you through and I appreciate the cooperation of colleagues.

This panel is excused and we will move on to the second panel. Please make sure that you, please go as fast as possible.

And new panel, come up. And if you could make sure that your statements do not exceed 4 minutes we will get started in a moment. Thank you very much, gentlemen. We are rushing. We want to end this when the memorial service begins out of respect.

So, we are going to start off the second panel with General Wesley Clark, Co-Chairman, Board of Directors of Growth Energy. And we are going to move down. I am going to ask each of you, 4 minutes please to make up for a little lost time.

General, we are very honored to have you here today.

STATEMENT OF GENERAL WESLEY K. CLARK (RETIRED), CO-CHAIRMAN, GROWTH ENERGY

General CLARK. Thank you very much Chairman Boxer, Ranking Member Vitter and other distinguished members of the Environment and Public Works Committee. Thanks for the opportunity to be with you today.

So, I want to start by just saying that I believe, first of all, I am in, as Senator Inhofe mentioned, I am in the energy business. So, I am in oil, I am in gas, wind, solar and biofuels. I have looked at the whole thing. I am in the financing side of it on numerous boards of directors. And my real interest is American national security and the prosperity of Americans.

So, I want to try to take the broadest picture in the couple of minutes I have got here. I think the Renewable Fuel Standard is a success. It has reduced our dependence on foreign oil, it has created 400,000 American jobs, revitalized the rural economy, puts $42 billion a year into it, lowered the price of gasoline at the pump and improved the environment. It is a success.

Corn-based ethanol is the first step in bringing renewable fuels. You have got to build a distribution system and you have got to have the opportunity to put it into the automobile and the manufacturers have to accept it.

So, we have hit the blend wall right now. The blend wall is actually an artificial creation. We can go through the blend wall anytime we put E15 and E85 in. E15 was extensively tested, 80 vehicles, 150,000 miles, works fine, 2001 on, and all the brand new automobiles have the warranties for E15.

Seventeen percent of the corn crop is actually used in fuel. Corn-based ethanol is a factor in reducing the volatility of corn prices. As everybody on this Committee understands, I am sure, the $8 per bushel price for corn last summer was primarily a function of drought and projections of reduced harvest. It was not a function of ethanol demand.

Right now, corn prices are under $4.50 a bushel and anybody in the livestock or poultry business has to be happy with that because that is right at the cost for what it is for a farmer to grow it. The biggest factor in grain prices is actually the cost of fuel. So, that is what is really affecting us here.

As far as the poultry industry is concerned, I am sorry Senator Boozman is not here, but our company, Tyson in Arkansas, has had record profits last year despite $8 per bushel corn prices.

So, I think that we have got to see here, the big picture is we are moving off dependence on foreign oil. I think we should produce as much domestic oil as we can. But we need this biofuel. We are saving, as Senator Fischer said, about $40 billion a year in the American economy right now. We will go over $100 billion of savings into our economy when we enact and get fully up there with renewable fuels. It is where we need to be.

I am sorry about the EPA proposal. I think it hurts investments when Congress or EPA tinkers with these expectations. The cellulosic industry had a tough time dealing with the financial crisis of 2008. It chilled investment, and congressional tinkering with mandates and things like this further scares investors off.

We have the technology now. One of the companies that I am associated with, POET, their plant is coming on board in Emmetsburg, Iowa, late this spring. We will be producing 25 million gallons per year of cellulosic. It is combined with a corn ethanol plant. It can be licensed, that technology, and it will spread rapidly throughout the Midwest provided that we make space in the market to sell ethanol. And that is really the issue here.

We need the help from the U.S. Congress to have the oil industry cooperate with us. We are all on the same team here trying to help promote American prosperity and energy independence. Let's get that fuel into the marketplace.

Thank you.

[The prepared statement of General Clark follows:]

777 North Capitol Street, NE, Suite 805, Washington, D.C. 20002
202.545.4000 202.545.4001 GrowthEnergy.org

Testimony of General (Retired) Wesley Clark

Co-Chairman, Growth Energy

Before the Senate Environment and Public Works Committee

December 11, 2013

Chairman Boxer, Ranking Member Vitter and all the members of the Committee, thank you for the opportunity to present testimony on the Renewable Fuel Standard.

I am retired U.S. Army General Wesley Clark, Co-chairman of Growth Energy, the country's leading trade association of ethanol and renewable fuel producers. Growth Energy represents 80 ethanol plants in 14 states and 81 associate members involved in the value chain of producing ethanol. Our plants produce ethanol from grain and are leaders in innovating in second-generation fuels from sources like plant wastes and algae.

Prior to my advocacy on renewable fuels, I spent almost 40 years in our nation's armed forces and have spent a majority of my time outside of the military discussing our nation's foreign policy and threats overseas. I can say without hesitation that our nation's addiction to foreign oil is one of the biggest issues facing our nation – even with newfound domestic supplies of oil and natural gas.

One of the biggest reasons why Congress passed and President Bush signed into law the Renewable Fuel Standard was because of this dangerous addiction to foreign oil. And it has worked. Since 2005, our dependence on foreign oil has decreased from 60 percent to 40 percent, a 33 percent reduction.

More efficient automobiles and increased oil production have absolutely played a role in this, but let's look at the increase in biofuels compared to the increase in oil production. From 2005 to 2012, U.S. oil production has increased by roughly 25 percent on the back of newfound oil resources. In that same time period, ethanol production has increased by 240 percent, and biodiesel production has increased by 880 percent.

My message to the Committee is this: the Renewable Fuel Standard (RFS) is an overwhelming success. It has reduced our dependence on foreign oil and made our nation more energy independent, created American jobs, revitalized rural America, injected much-needed competition into a monopolized vehicle fuels market, lowered the price at the pump, and improved the environment. That is a great record of accomplishment – one that I would call a brilliant success. It is wise policy, and a tribute to its bipartisan passage.

In particular, the RFS:

- Is one of the key components that have helped lower our dependence on foreign oil by 33 percent.
- Has cracked the monopolistic stranglehold that petroleum-based fuels have on our transportation system, injecting much needed competition and providing drivers a choice at the pump.
- Supports 400,000 American jobs and generates $42 billion in economic activity.
- Lowered the price at the pump for all American drivers. Wholesale ethanol was 73 cents less expensive than regular gasoline at the close of business on Friday, and has been a dollar at some points this year.

These are real, tangible results that benefit every American today. But if some had their way, we'd throw all of this progress away so the incumbents can shut out competition and maintain their stranglehold on the wallets of American drivers so that Americans will never escape the burden of imported oil and imported, monopolistic fuel pricing.

We see a different path forward. The Renewable Fuel Standard and higher-level blends of ethanol present the first real opportunity to create fuel diversity in the United States. It has been over 100 years since Americans had a choice in what they use in their automobiles. Now, the oil lobby has begun a sustained, multipronged eampaign to kill renewable fuels just as it ramps up and threatens oil's market share.

The premise that America's newfound oil and gas resources mean we no longer need renewable fuels is simply not true. We are this year going to import almost $400 billion worth of petroleum, the majority from OPEC countries. In addition, in September imports increased by almost 1 million barrels/day. This is to be expected as the economy returns to growth. These imports suck money away from our economy - just like a per capita tax on each and every American of about $1200.

Biofuels like ethanol keep those funds inside our economy, creating jobs and building communities. Every one percent of ethanol in our fuel supply retains over $3 billion in our own economy. Today, we are helping retain approximately $30 billion that would have flowed out of our economy. When we fulfill the full RFS vision in 2022, ethanol and other biofuels will be responsible for keeping almost $100 billion annually in our economy that would otherwise go to other nations.

Moreover, oil is a global market. We don't control the price. Because ethanol is historically an average of more than 50 cents gallon cheaper than oil, we are further helping hold a lid on gasoline prices.

With the success of the RFS, the United States is on the brink of energy independence and energy diversity. On behalf of Growth Energy, the biofuels industry, and America's rural communities, I urge you stay true to the Renewable Fuel Standard that is working and already showing results while still in its infancy.

The RFS will create true consumer freedom in the fuels market. It has reduced fuel costs for American families, has freed the American taxpayer from having to support the agricultural economy, and spurred significant investments in rural America. My testimony today covers seven key topics:

- Success of the Renewable Fuel Standard (RFS)
- National security benefits of the RFS
- Environmental improvements from the use of biofuels
- How the RFS has revitalized rural economies
- Biofuel production's limited impact on food prices
- The so-called "blend wall"
- How E15 is safe and ready for use

Success of Renewable Fuel Standard (RFS)

The RFS is the bedrock federal policy that has spurred billions of dollars of investment in America's cutting-edge biofuels industry. It has been the primary driver behind the only large-scale, commercially-viable alternative to regular gasoline – ethanol. Because of the forward-looking, long-term nature of the policy, the United States leads the world in innovation in biofuels, attracting investment from around the world. Today, because of the RFS, there are more than 200 ethanol biorefineries across the country and dozens of projects that will make advanced or cellulosic biofuels.

The RFS has provided U.S. drivers with a vehicle fuel that is made up 10 percent biofuel, and that fuel blend is available in all 50 states. If the U.S. ethanol industry were a foreign supplier, only Canada would supply the U.S. with more fuel than the U.S. ethanol industry. This newfound biofuel supply has been a key component in helping reduce our dependence on foreign oil by 33 percent since 2005. Getting rid of the 10 percent of biofuels in our passenger vehicle supply would pose big problems.

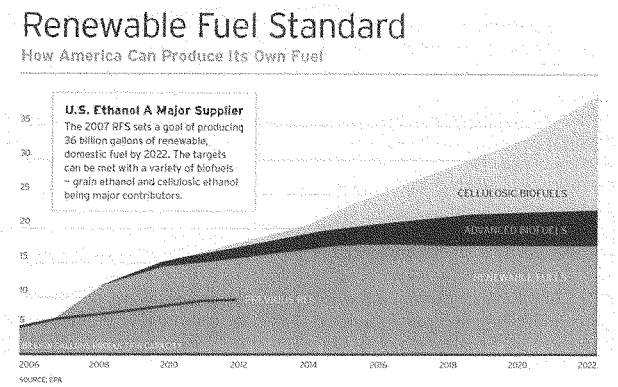


Figure 2

Advanced and cellulosic biofuels research, investment, and development are occurring right now. Growth Energy has several members that are producing these fuels because of the market signal provided by the RFS:

- A cellulosic ethanol plant that is poised to produce the first commercially available cellulosic biofuel from corn stover in early 2014.
- A first of its kind algae bioreactor utilizing carbon dioxide and waste water and has operated it for over two years.
- A project to utilize wood killed by pine beetles as a fuel feedstock.
- Plants that will convert the fiber in the corn kernel into cellulosic ethanol.
- Plants that are using grain sorghum along with biogas from a manure digester to produce an advanced biofuel.

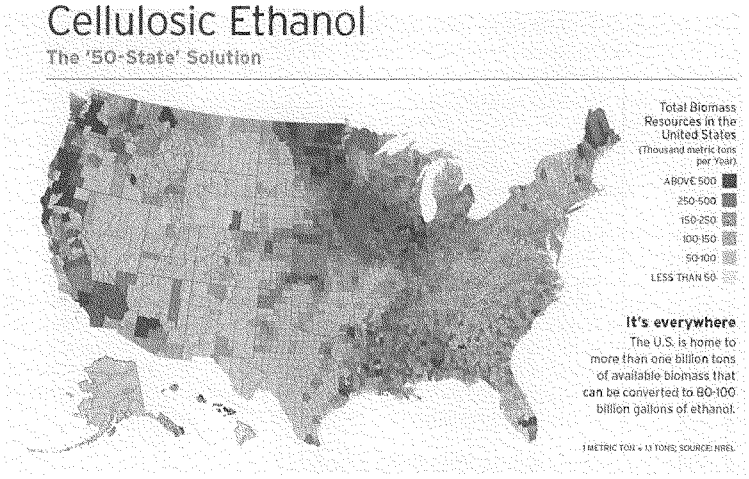


Figure 3

These exciting projects are just among our membership. Advanced and cellulose fuels that are now being developed that will provide benefits and economic opportunity to every state in the nation. Any changes to the RFS will likely kill investment in any advanced or cellulosic fuel project. Changing the RFS puts at risk an entire American-made, American-built industry at a time we can least afford to lose jobs. Changing the RFS risks future research and development of advanced and cellulosic biofuels, which occupy the largest portion of the RFS in the future. We are just five years into a 15-year plan, and we are just three years removed from when the Environmental Protection Agency finalized RFS rules. Any changes to this policy will have devastating effects.

National Security Benefits of the RFS

The U.S. continues to be extremely vulnerable to shocks in the oil supply and price disruptions –from both foreign supply and the domestic supply chain. During the last decade, the price of oil has nearly quadrupled, going from roughly $25 per barrel in 2001 to nearly $100 per barrel today; that price disruption has had a significant impact on American consumers and the American economy, with the price of gasoline rising from $1.09 per gallon in 2001 to roughly $3.25 per gallon today. Despite significant increases in domestic oil production, we are still importing millions of barrels per day of foreign oil sending more than $400 billion overseas last year alone. These imports are from a number of

countries in unstable regions, like the Middle East, that have little interest in the United States' energy security (data from the U.S. Energy Information Administration http://eia.gov).

We are also spending billions of dollars each year to protect oil supply routes in the Middle East – these costs could be dramatically reduced if we turned to more home-grown renewable ethanol. As an example, according to RAND, the U.S. spends between $67 and $83 billion per year protecting global oil interests ("Imported Oil and U.S. National Security", RAND Corporation, 2009). Critics of renewable fuels point to Canada as our largest source of our imported oil, but even Canada has recently developed assets, such as the Enbridge Northern Gateway Pipeline, aimed at exporting their oil to China rather than exporting to the United States (http://www.northerngateway.ca/). Even ExxonMobil acknowledges processing nearly three times as much oil as is produced here in the United States ("What am I paying for in the price of a gallon of gasoline?", Ken Cohen, January 27, 2012 http://exxonmobilperspectives.com).

All of this additional oil is purchased on the global market that is still largely controlled by OPEC. Any time there is a supply disruption or OPEC arbitrarily decides to cut production, it hurts American consumers. We've seen Iran consider choking off the Strait of Hormuz, we've seen workers strike in Venezuela, we've seen pipelines burst, and the list goes on – all of these situations have both impacted the supply of oil and the cost American consumers pay at the pump. Even here in the United States, we have seen refineries taken offline for seasonal maintenance, in the Midwest, thus causing outrageous price increases in Minneapolis and other places across the region ("Pain at the Pump as Gas Prices Soar above $4", http://kstp.com/article/stories/s3034685.shtml; "Spike in Twin Cities Gas Prices Leaves Drivers Frustrated," http://www.startribune.com/business/190374421.html).

EPA's Misguided Preliminary Rule for 2014 RFS volumes

The EPA proposal sets us back on the path to fulfillment, will chill investment in biofuels, rewards deliberate and willful resistance to the law, and will encourage further and more intensive efforts to gut RFS in the years ahead. It would cause severe harm to farmers, the biofuels industry, and the nation's economy. This proposal is already creating great uncertainty for farmers and other industry investors.

The RFS was approved by a bipartisan majority in Congress and enacted into law nearly six years ago. Since that time, the oil industry has used its considerable power to delay, litigate, and undercut the RFS. Now, by refusing to take any steps to allow higher biofuel blends into the consumer marketplace, the oil industry is claiming the statutory volumes of the RFS cannot be met because of the so-called "blend wall."

The EPA's proposal to waive the statutory renewable fuel volumes mistakenly accepts this logic. It ignores the potential for E15, E85 and biodiesel. It doesn't take into account the large surplus of RINs, which could be used in 2014 and it does not factor for increased gasoline demand. And, most fundamentally, it does not follow Congressional intent in creating the RFS program. The program was designed to spur investment in renewable fuels, not to punish those who have invested while rewarding those who have impeded development.

Since the RFS' inception, the ethanol industry has produced ample biofuel to meet the statutory obligations of the RFS and it has ample capacity to do so again in 2014. With this proposal, EPA is waiving the statutory volumes – including, for the first time, the total renewable fuel volume – on the grounds that there is insufficient demand for higher-level blends, notwithstanding the fact that the oil

industry has refused to give consumers a choice at the pump. The statutory volumes can easily be met if the oil industry would simply comply with the original intent of the RFS and allow higher ethanol blends like E15 to be competitively sold to consumers.

While some have claimed that the infrastructure is not in place to dispense ethanol blends above 10 percent, that is simply not the case. The vast majority of gasoline dispensing equipment made since 2008 is warranted for ethanol blends as high as E15 and underground storage tanks made in the last 20 years are equipped to handle blends up to 100 percent ethanol. As for the market, nearly 80 percent of the vehicles on the road today are approved by EPA for E15 and there are over 16 million flex-fuel vehicles that can consume even higher blends – up to and including E85. Also, EIA recently increased its gasoline demand estimates indicating 2.1 to 2.9 million gallons of additional use per day, which means even more ethanol can be blended as E10. Clearly there is the capacity and ability to push through the so-called "blend wall" – now is not the time to retreat from the goals of the RFS.

This proposal would also jeopardize the tremendous success our nation's farmers have seen as a result of the certainty of the RFS with net farm income increasing by 51 percent while federal farm payments have decreased 57 percent.

Similarly, the proposal directly threatens an American-made biofuels industry at a time when our nation can least afford to lose jobs. Companies from all over the world have invested billions of dollars in first and second generation biofuels in the U.S. and are poised to do more. Arbitrarily reducing the levels established in the statute threatens investments that are making commercial production of cellulosic ethanol a reality – projects that will help achieve the significant greenhouse gas reduction goals outlined in the RFS.

EPA should move the RFS forward, not backward. EPA should not reduce the total renewable fuel volume below the level that provides for 14.4 billion gallons of conventional ethanol and attainable domestically produced advanced biofuel levels.

Environmental Benefits of Biofuels

The RFS has been one of the most successful energy policies of the last 40 years. It is reducing greenhouse gas emissions, reducing our dangerous dependence on foreign oil and creating American jobs. EPA estimates that by 2022, the RFS will reduce greenhouse gas emissions by 138 million metric tons or the equivalent of taking 27 million passenger vehicles off the road. In particular, studies show that traditional corn ethanol reduces greenhouse gas emissions as much as 59 percent compared to gasoline (*Improvements in Lifecycle Energy Efficiency and Greenhouse Gas Emissions of Corn-Ethanol*, Liska et al., which can be found here: http://onlinelibrary.wiley.com/doi/10.1111/j.1530-9290.2008.00105.x/abstract).

As we move to the next generation of biofuels, greenhouse gas emissions will be even further reduced. Recent studies have shown that using switchgrass and corn stover to produce cellulosic ethanol will reduce greenhouse gases as much as 94 percent and over 100 percent respectively (*Energy and Greenhouse Gas Emission Effects of Corn and Cellulosic Ethanol with Technology Improvements and Land Use Changes*, Wang et al., which can be found at http://www.sciencedirect.com/science/article/pii/S0961953411000298).

The long-term certainty of the RFS has driven significant investment in the next generation of biofuels and new technologies both in ethanol production and in agriculture. By increasing yields, increasing efficiency, and deploying new technologies, ethanol and agriculture production continues to soften its footprint on the environment – particularly as fossil fuels like crude oil and natural gas become harder and harder to extract. Just in the past four years, we have seen significant results - we are producing more ethanol for each bushel of corn (2.82 gallons/bushel in 2012 vs. 2.78 gallons/bushel in 2008), using less water (2.70 gallons of water per gallon of ethanol in 2008 vs. 2.72 gallons of water per gallon of ethanol in 2012), and are using less energy to produce a gallon of ethanol (23,862 BTU/gallon in 2012 vs. 26,208 BTU/gallon in 2008) (Mueller and Kwik, *2012 Corn Ethanol: Emerging Plant Energy and Emerging Technologies*, http://www.erc.uic.edu/PDF/mueller/2012_corn_ethanol_draft4_10_2013.pdf).

Additionally, some of these newer technologies will be "bolted-on" to existing biofuel production to take advantage of current power and resource streams – maximizing efficiency and driving greenhouse gas emissions down even further. Only by keeping this policy in place will we continue to see this type of investment in more efficient systems to improve our environment.

How the RFS Has Revitalized Rural Economies

The RFS has had a tremendous positive impact on rural communities and the agriculture sector. Since the enactment and implementation of the RFS, net farm income grown by 51 percent from 2005 to 2011 helped in part by the RFS. The RFS also supports 400,000 jobs and more than $40 billion in economic activity.

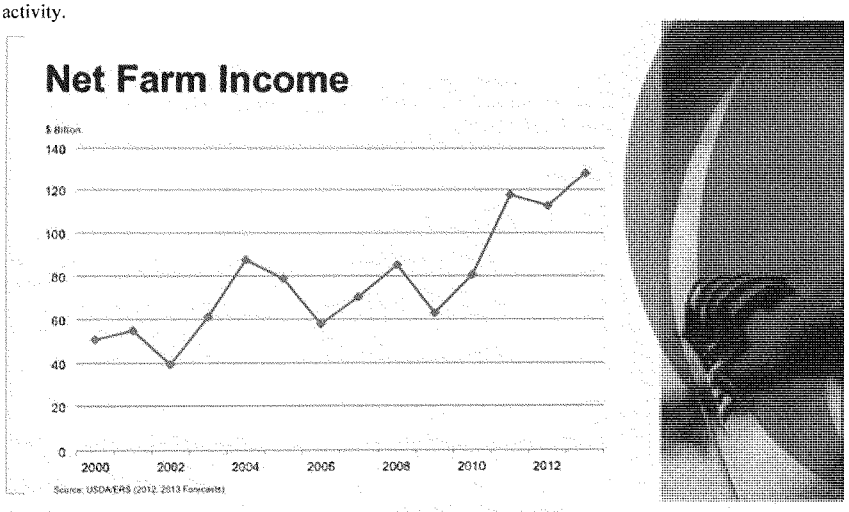


Figure 1

In addition, renewable fuels have helped create a balance in supply and demand for crop commodities that has alleviated the need for most forms of government payments and created a market-based, rather than a government-based, agricultural economy. This in turn has driven farmers to utilize new technology and soil resources to produce crops. According to USDA, since 2004, planted acres of corn have increased from 80.93 million acres to 97.28 million acres for 2013. Harvested corn acres increased from 73.63 million acres in 2004 to 87.38 million acres in 2012. Similarly, production has driven technology and efficiency – since 2000, corn yields have gone from 137 bushels per acre up to 153 bushels per acre in 2010. Likewise, taking an example from the poultry industry, USDA shows that turkey production was $2.89 billion in 2004 increasing to $4.99 billion in 2013. These figures prove the RFS has, and will, continue to drive growth across all of American agriculture.

Like any commodity, the market responds to natural forces such as supply and demand. The market for corn is no different. While the RFS has created additional demand for corn, more importantly, it has driven additional corn production that otherwise would not have occurred while producing significant quantities of co-products that are substitutes for starch used in ethanol production. For decades, farmers were paid far less than the price of production for their corn, and the American taxpayer heavily subsidized the price. Last year, ethanol critics alleged the RFS caused prices to rise more than $8 per bushel, when, in fact, the price increase was a direct result of one of the worst droughts in our nation's history. In fact, those purchasing corn could have locked in prices for under $5 per bushel as late as June 2012. Today, the price of corn is $4.36 per bushel. The RFS has tools built in that allow states to waive the RFS in cases of severe economic harm. Twice, states have petitioned EPA to waive the RFS and both times, the petitioners have failed to make the case.

A final point that should not be overlooked concerns the taxpayer savings from reduced farm program payments that have occurred as the RFS has been implemented. According to data from the Congressional Budget Office, the average federal farm program payments to corn producers averaged over $4.4 billion per year for the 2002 – 2006 crop years. Corn payments averaged about $1.9 billion per year from 2007 to 2011, a reduction in taxpayer costs of almost 57 percent.

Biofuel Production's Limited Impact on Food Price

There are many factors that had an impact on food prices, including crop production shortfalls and increased demand overseas. On June 26, 2013, Dr. Joseph Glauber, Chief Economist at the United States Department of Agriculture testified before the Subcommittee on Energy and Power of the House Committee on Energy and Commerce that the total impact of changes in the corn market on retail food prices was small. This is consistent with prior analysis done by USDA, the World Bank and many others.

Countless academic, economic and government studies have disproven the misplaced notion that biofuels production has increased the cost of food. These studies have instead found that record-high oil prices, Wall Street speculators and the high costs of manufacturing, packaging and transportation have far more impact than ethanol on everyday grocery prices. There is no substantial link between ethanol production and grocery prices. Despite the proven facts, misinformed critics still actively try to stoke illegitimate fears that demand for ethanol will somehow drive up food prices.

Corn is only a fraction of overall food and grain costs. For every $1 spent at a grocery store, 85.9 cents go to marketing, which includes labor, transportation, energy, and packaging costs. Just 14.1 cents are

associated with farm costs — of that, only 3 cents are associated with the value of corn. The USDA forecasts that the price of food will increase by 3.5 percent in 2013, slightly above historical inflation averages of approximately 3 percent per year. Food prices rise when oil prices rise. The price of food is driven up by transportation and packaging — not by renewable fuels like ethanol. Food processing is energy intensive, and packaging frequently uses petroleum-based raw materials. Transporting food worldwide also requires large amounts of fuel and subsequently large amounts of oil.

Figure 9

Contrary to the unsubstantiated opinions of those who would repeal the RFS, the chart below graphs the Consumer Price Index from 2005 to May, 2013 for all items, food, and gasoline. This clearly demonstrates that gasoline prices have played a far bigger role in rising consumer prices that food costs.

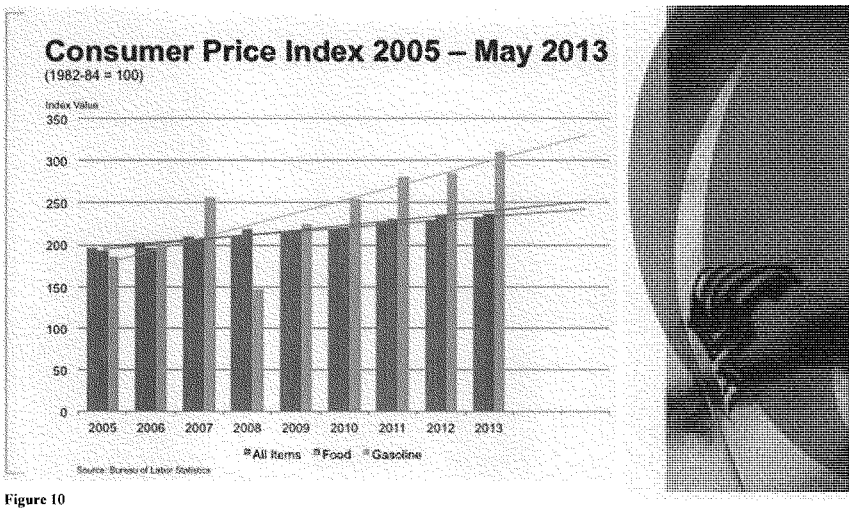


Figure 10

Since 2005, the CPI for food has increased about 18.3 percent, roughly in line with the CPI for all items including food and gasoline which rose by about 16 percent. The index for gasoline increased by nearly 40 percent and in recent years, the trend has followed a very steep upward path. Interestingly, this is occurring as we have increased the amount of ethanol blended into our gasoline supply which every credible analysis has concluded that consumer gas prices would be even higher if it were not for ethanol holding prices down.

These three charts that graph the prices spreads between retail, wholesale, and farm values help provide the answer. Farm values for choice beef, pork, and broilers – the primary livestock products demanded by consumers – have risen somewhat over the last decade. For the most part, wholesale values have paralleled the upward movement of farm values. However, the retail – wholesale/farm price spread has increased at a much faster rate.

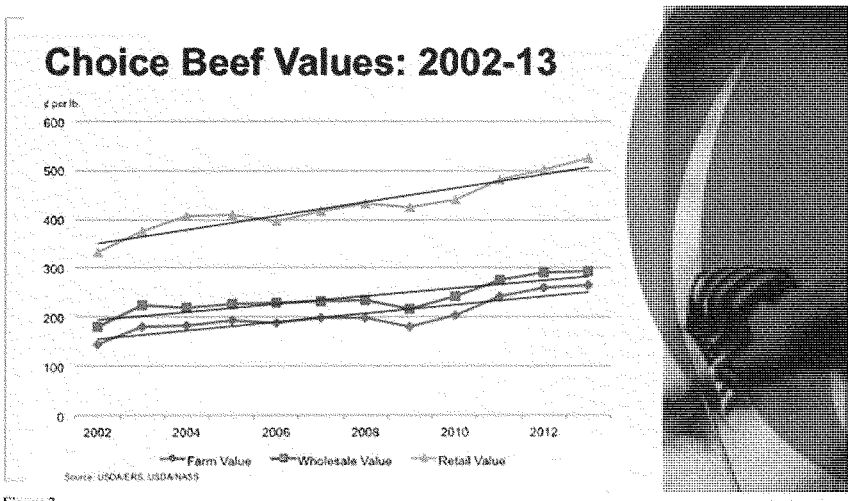


Figure 2

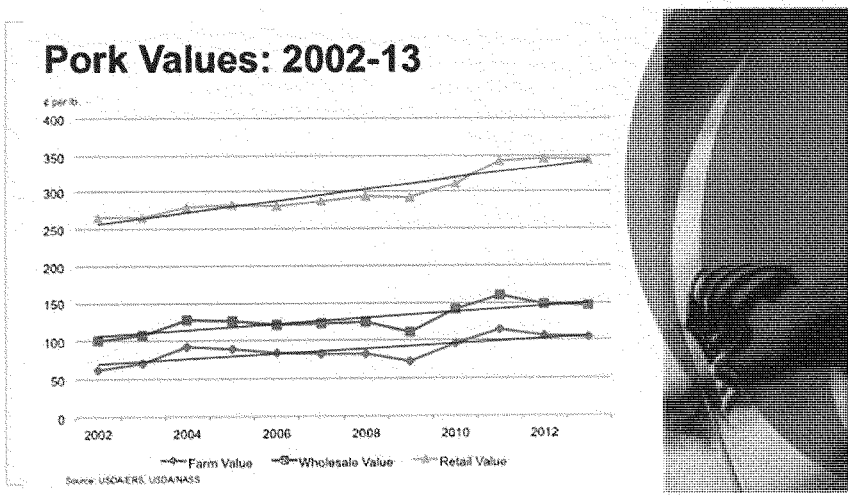


Figure 3

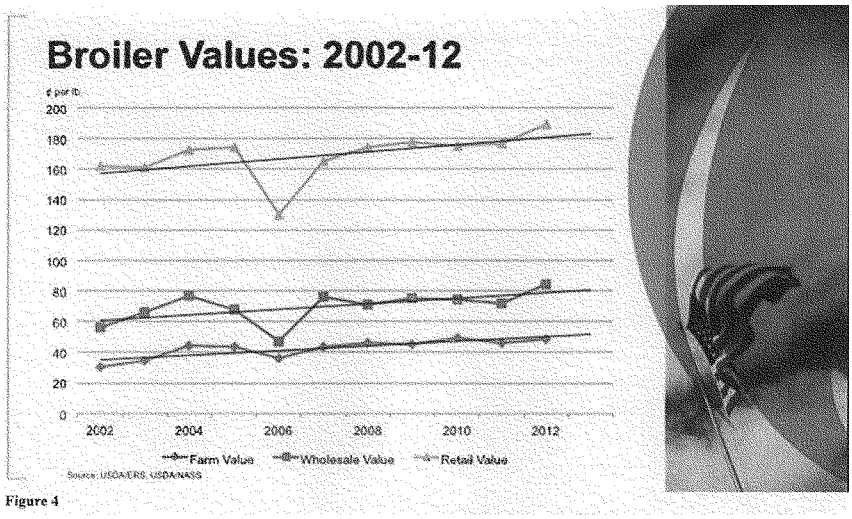


Figure 4

The primary cause of increased consumer prices rests not with livestock producers or those who process their products, but with the same food companies who are complaining about the RFS. According to the World Bank, over 50 percent of the global increase in food prices is due to energy costs and for the U.S. the increase in the retail prices spreads suggest that either energy costs and other non-farm cost factors are being passed on to consumers or retained by the food companies as increased profit margins.

How the RFS has Helped Livestock Producers

Biofuel production only removes the starch from the corn. The protein, fiber, and oil is returned to the animal feed supply in the biofuel feed co-product known as distiller's grains. Distillers grains amount to one-third of the corn used in ethanol production. According to USDA, 80 percent of the calories from the decline of corn-based livestock feed have been returned to the livestock industry in this form. Distiller's grains also replace soybean meal in feed rations, meaning there is less demand for soybeans, requiring fewer acres planted to soybeans.

Distiller's grains feed cattle, hogs, poultry and other animals around the world. American farms can create food and fuel. In fact, the ethanol industry produced 38.8 million tons of distiller grains just last year, the weight equivalent of nearly 1.4 billion bushels of corn and almost 400 aircraft carriers.

American corn growers have demonstrated they have more than enough capacity to satisfy all demand for livestock feed, exports, and ethanol. Because of new technology that allows farmers to grow more crops on fewer acres of land, corn farmers are poised to increase plantings even more to take advantage of the growing market for renewable fuels. On July 11, USDA pegged this year's corn crop at 14 billion bushels.

One of the biggest myths perpetuated by those who dislike the RFS is that 40 percent of the corn crop goes to biofuels. This is not only wildly false, it is completely misleading.

As the chart shows, only 17.5 percent of net corn acres are used for renewable fuels. Actual "net acres" used for ethanol are less than 50 percent of gross acres. Only the starch is used for ethanol. Distiller's grains displace corn and soybean meal. Corn yields are three times soybean yields.

~~Forty percent of the corn crop goes to ethanol~~

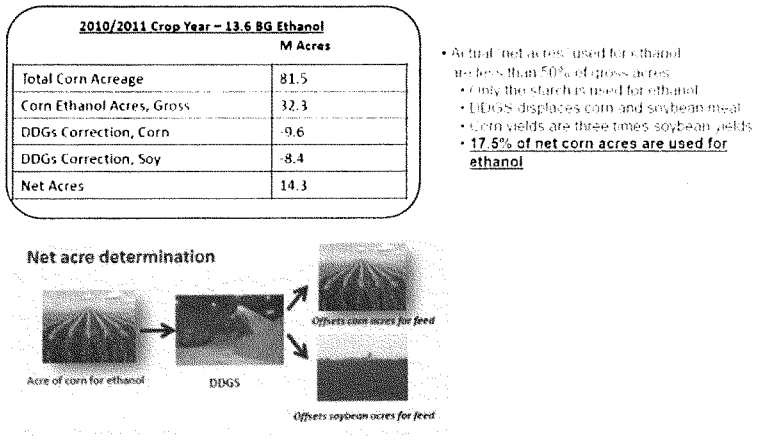


Figure 5

In the fall of 2012, Growth Energy provided comments to the EPA in response to requests to waive the RFS from various state governors. In those comments, we demonstrated that waiving the RFS would jeopardize farmers, rural jobs and economies and would increase consumers' prices at the pump. Specifically, we estimated that waiving the RFS could result in up to $7.8 billion in lost revenue and a reduction of 8,300 jobs ~~lost~~ in ethanol producing areas. Additionally, waiving the RFS would result in a $7.5 billion a year cost to consumers through higher fuel costs and between $5.8 and $27 billion losses to American farmers. Finally, companies have already spent billions of dollars building facilities, harvesting cellulosic materials and planning on the certainty of a 15 year RFS program as they ~~move to~~ prepare to produce the next generation of biofuels.

In fact, USDA estimates that the corn demand lost from 2011 to 2012 due to the drought was far greater for ethanol than livestock feed. The demand lost from the ethanol industry was more than 350 million bushels from 2011 to 2012, while the demand lost from animal feed was less than 100 million bushels. And with a 14 billion bushel crop projected this year (compared to last year's 10.7 billion bushel crop), corn demand for animal feed is projected to increase by 16 percent to 5.2 billion bushels, while corn demand for ethanol production is projected to increase by 5 percent to 4.9 billion bushels.

Despite overwhelming data, some leaders in the livestock and poultry industry have blamed ethanol for rising feed costs and declining profit opportunities throughout the livestock production sector. The difference between the total value of U.S. livestock and poultry production and the cost of feed is increasing, not declining. In fact, for the seven years prior to the enactment of the RFS, the margin averaged $83.4 billion per year. In the seven years since RFS became law, the margin has increased by nearly 18 percent to an average of $98.2 billion per year.

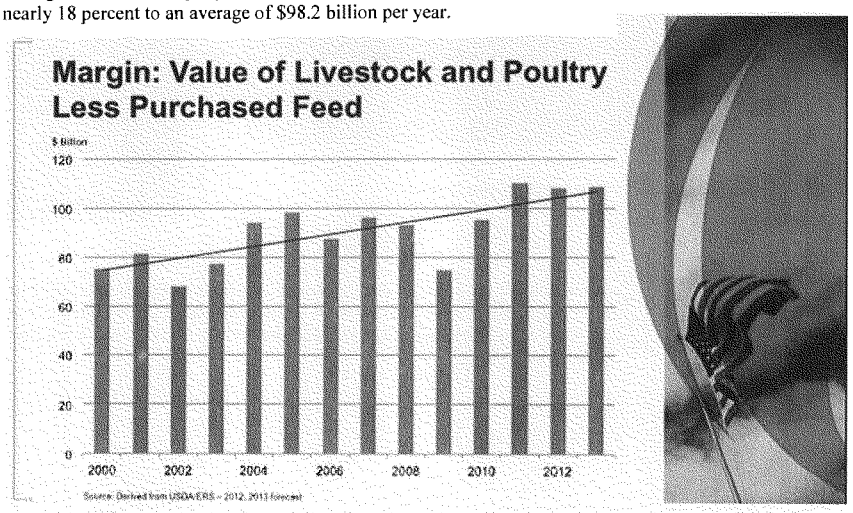


Figure 6

This chart shows what has happened to the production of the four major livestock categories – beef, pork, broilers and turkey over the 2003-14 period. To its credit, the livestock industry has become far more efficient in managing their animal feeding operations and contrary to the claims of some, livestock production has in fact increased by about 5 billion pounds over the period charted.

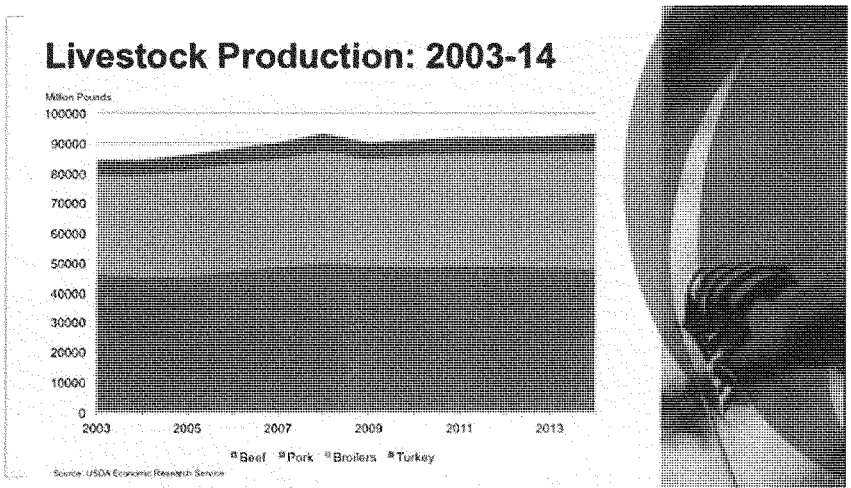


Figure 7

When prices are viewed in conjunction with production, one must question the veracity of the statements by those who suggest the RFS is causing the demise of the U.S. livestock industry. Not only has livestock production increased since enactment of the RFS, but prices for beef, pork, broilers and turkey have also risen compared to the years prior to the RFS.

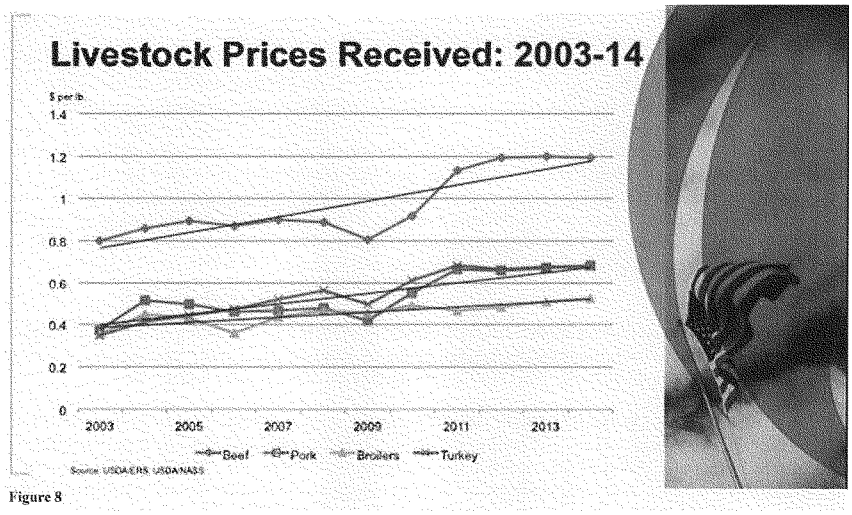


Figure 8

To summarize these charts: livestock production is up, livestock prices are up, and the margin between livestock values and the cost of feed has grown appreciably all since the RFS was enacted. This hardly paints a picture of an economically distressed U.S. livestock sector.

The So-Called "Blend Wall"

Recently, the oil industry has falsely blamed the Renewable Fuel Standard as the cause of higher gasoline prices. These stories revolve around a false premise — that prices for a RFS compliance mechanism demanded by the oil industry when the RFS was first passed into law – Renewable Identification Numbers (RINs) – are responsible for the increase in domestic gasoline prices.

Many have termed this the "blend wall," and breaking the blend wall is vital to the success of the RFS. With ethanol consistently trading at a significant discount to wholesale gasoline, oil at nearly $100 a barrel and gasoline selling for more than $3.25 per gallon, it makes little sense to prevent E15 and even higher ethanol blends into the market. With the RFS goal of 36 billion gallons of renewable fuel by 2022, it was clear higher blends of ethanol would be required regardless of the level of fuel consumption. However, other than the use of ethanol to blend E10, the oil industry has done nothing but erect hurdles to higher blends of ethanol and now their publicly-stated goal to completely eliminate the RFS altogether.

The charge that RIN prices are the cause of higher gas prices is objectively false. RINs for ethanol are provided free of charge to oil companies when they blend ethanol. Any added value comes from trading RINs in an opaque marketplace between oil companies. Ethanol has consistently been trading — and will

likely continue trading — significantly cheaper than gasoline. Recently, wholesale ethanol has been up to $1.00 per gallon less expensive than wholesale gasoline.

RIN prices are increasing because of refiners' unwillingness to blend ethanol and instead are willing to pay a premium specifically not to blend additional ethanol. Meanwhile, oil companies are currently making record margins. EPA has specifically said there is not a shortage of RINs for 2013. In fact, there are more than 2.6 billion carry-over RINs from 2012. The simple solution to this problem is to adopt the higher level ethanol blends such as E15. As soon as the oil companies adopt the higher blends, plenty of RINs will become available and the price for those RINs will likely decrease significantly based on lower demand. The oil industry has erected hurdle after hurdle to E15 and mid-level ethanol blends and continue to fight to try and eliminate the RFS. By refusing to sell higher ethanol blends, the oil companies only maintain the status quo: high gas prices for the consumer and record profits for the five largest oil companies.

The RFS continues to call for increasing amounts of biofuel to be blended into the country's fuel supply. However, there are market limitations put in place by the oil industry effectively "capping" the amount of renewable fuel that can be blended. This creates overproduction in a saturated fuel market.

The Volumetric Ethanol Excise Tax Credit (VEETC) was designed to provide a financial incentive to provide ethanol blenders – not ethanol producers – to blend ethanol and make sure the blend wall didn't occur. The primary recipients of this incentive were integrated oil companies. VEETC paid out tens of billions of dollars before it expired at the end of 2011 to help these integrated oil companies upgrade their distribution network to meet the future need for higher inclusion rates of ethanol.

E15 is Safe and Ready for Use

When the RFS was first created, it was apparent that our nation's energy infrastructure and economy needed a wider market for renewable fuels. Even under fuel use assumptions in 2007, when the RFS was expanded, higher-level ethanol blends like E15 would be required in order to meet the volumes contained in the statute. Unfortunately, the oil industry has decided to erect every public relations, legal and regulatory hurdle possible to avoid marketing fuel containing more than 10 percent ethanol. Instead of working to accommodate fuel choice for consumers, the oil industry has chosen to try to shut out competing fuels from their vertically integrated monopoly.

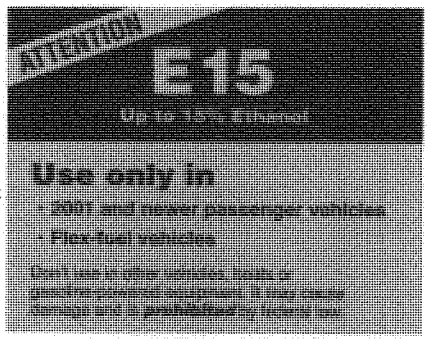
Because the oil industry continues to stifle fuel choice at the pump, most consumers don't have access to E15. In those fueling stations where retailers have decided to offer E15 despite pressure by the oil industry, we have seen robust sales. This is because E15 is less expensive, safe for use, and high-performance.

More than four and a half years ago, Growth Energy led the way by filing a waiver with the U.S. EPA to allow the sale of ethanol blends up to E15 beyond the current 10 percent ethanol in today's current fuel supply. By moving the nation to E15, we will further constrain the price at the pump, add 136,000 new American jobs, limit greenhouse gas emissions even more and reduce the demand for gasoline produced from foreign oil by up to 7 billion gallons. In addition, E15 would reduce the use of aromatics in gasoline, which are petroleum-derived fuel components known to harm human health.

When Growth Energy filed the original waiver for E15 with the U.S. EPA, we sought approval for all gasoline-powered engines and provided ample data to demonstrate the fuels' safety and efficacy. The Department of Energy chose to narrow their specific testing by putting E15 on a path for approval for only 2001 and newer vehicles. More testing was done on E15 than any other fuel ever approved by EPA under the Clean Air Act, with the Department of Energy (DOE) testing 86 vehicles for a total of 6 million miles. DOE's testing found absolutely no issues with emissions equipment or with engine durability. With DOE's data in hand, the EPA ultimately approved our waiver in January 2011 for all 2001 and newer passenger vehicles – more than 80 percent of the vehicles on the road today. In fact, Ford, General Motors and other auto manufacturers have already started labeling their vehicles as approved for E15 – General Motors for model years 2012 and 2013, Ford for model year 2013. Further, NASCAR has been running on E15 for 3 years for a total of 5 million miles in some of the world's toughest driving conditions and they have experienced an increase in horsepower, no mileage loss or mechanical problems suggesting that E15 is more than safe for use in everyday automobiles.

Many other criticisms of E15 have been made with no scientific basis whatsoever. For example, an oil industry funded-study of E15 by the Coordinating Research Council (CRC) is significantly flawed with DOE publicly releasing a direct response entitled "Getting It Right: Accurate Testing and Assessments Critical to Deploying the Next Generation of Auto Fuels" (http://energy.gov/articles/getting-it-right-accurate-testing-and-assessments-critical-deploying-next-generation-auto). First, the CRC was extremely limited – only testing eight vehicles while the DOE tested 86. CRC also failed to test the engines on E10, the standard consumer gasoline found throughout the United States. CRC only tested 3 of the 8 vehicles on ethanol free gasoline and even one of those failed. CRC also chose two engines that had existing durability issues – one of which had even been recalled. The test was also specifically designed to stress the engine valve train. To sum up their findings, DOE said, "We believe the [CRC] study is significantly flawed." DOE's findings were recently validated by the National Renewable Energy Laboratory (NREL)

It should be made clear that E15 is a voluntary choice both for retailers and for consumers. Fuel retailers should not face any significant incremental risk for offering E15, assuming they follow the misfueling mitigation rules. In addition, the decision to offer E15 is voluntary based on a retailer's assessment of return on invested capital, customer mix, and retail station configuration.



For small engines, marine applications, and gasoline engines other than 2001 and newer passenger vehicles, the law explicitly prohibits E15. Further, the EPA has issued a specific rule to mitigate consumer misfueling, including a label specific to E15. In fact, ethanol is the only fuel that requires a warning label at the pump. Additionally, ethanol is the only ingredient labeled in gasoline even though gasoline is a chemical cocktail which contains more than 200 different components some of which can pose serious health hazards.

Finally, there is no credible data to suggest that fueling with E15 would damage these small engines. The volume of fuel consumed by marine engines is only a small part of the U.S. gasoline demand – 130,000

barrels per day versus 8.46 million barrels per day of total gasoline consumption in 2011. Additionally, several manufacturers are manufacturing lawn equipment built to run on ethanol blends up to 85 percent. It makes no sense to make policy decisions that could deny the majority of U.S. drivers' access to cheaper, cleaner ethanol in order to accommodate a tiny fraction of fuel users who will have fueling alternatives readily available.

Conclusion

The RFS is a policy that is working. The EPA proposed EPA rule is troubling because it would chill investment in biofuels, reward deliberate and willful resistance to the law, and encourage further and more intensive efforts to gut RFS in the years ahead. This proposal will cause harm to farmers, the biofuels industry, American drivers, the environment, and our nation's economy.

The key to reducing prices at the pump and providing consumers real choice is to inject competition into the transportation fuel sector. The RFS does just that. If our goal is to reduce greenhouse gas emissions, the only statute that has required GHG reductions is the RFS. If our goal is to expand American made energy, the RFS is a solution. If we want to reduce foreign oil imports, the RFS is working.

The bottom line is that this is a policy that benefits all Americans. With oil prices at nearly $100 a barrel and gasoline continuing to be above $3.25 a gallon, we can no longer afford to be 90 percent dependent on fossil fuels.

I thank the Committee for allowing me to testify and look forward to any questions.

Questions from Senator Boxer:

1. ***It has been suggested that increased oil and gas development and production in the U.S. has rendered the 2007 RFS policy goal of energy independence from imported oil antiquated. Do you agree? And, if not, please explain why not.***

No, I do not agree. Each and every day, we continue to import millions of barrels of crude oil into the United States costing American consumers nearly $400 billion a year. While there has been tremendous growth in domestic oil production, the price of oil is set by the global market and we continue to see the price of a barrel of oil at about $100 per barrel. Only by continuing the highly-successful path outlined by the Renewable Fuels Standard, can we break our dangerous addiction to foreign oil. American-made biofuels make up nearly 10 percent of our fuel today and are poised to do much, much more. Only by keeping the RFS intact, can we get start to realize American energy independence.

2. ***Could you explain how the development of infrastructure and production facilities for the first generation of renewable fuels has been important to the development of second generation advanced biofuels?***

When the RFS was enacted in 2005 and revised again in 2007, we saw a renaissance with the growth of American biofuels. Many of these existing first generation facilities are looking at how they, too, can make the next generation of cellulosic biofuel. Some plants will actually co-locate their cellulosic facilities using corn stover (cobs, stalks, leaves, etc.) as a feedstock for cellulosic ethanol. By co-locating or "bolting on" to existing plants, they will be able to take advantage of existing marketing, feedstock procurement, power, storage, and other components that will make the production much more efficient and ultimately better for the environment. Additionally, by using "bolt-on" technology, these types of facilities can be replicated at the roughly 200 biorefineries already in place, expanding job creation throughout our economy.

3. ***Since the implementation of the 2007 RFS, does the evidence indicate that corn-based ethanol has caused corn prices to rise significantly and led to increased food prices for consumers? Please provide sources supporting your answer.***

I believe the evidence does not indicate that corn-based ethanol has led to increased food prices.

In the case of corn prices, USDA's data for the 2007-2008 marketing year shows the average corn price was 4.20 for that year. For the current marketing year, 2013-2014, USDA projects the average corn price to be 4.25-4.75 (http://www.ers.usda.gov/datafiles/Feed_Grains_Yearbook_Tables/Domestic_and_International_Prices/FGYearbookTable09Full.xls, lines 144O and 150O). The spot price as of March 13, 2014 was $4.66 on the Wall Street Journal's commodity cash prices page. This was down from $7.28 a year ago, a decrease of more than 36 percent (http://online.wsj.com/mdc/public/page/2_3023-cashprices.html). I have yet to hear of our nation's grocery bills being reduced by 36 percent when compared to last year.

Corn prices were higher last year, but that was not because of ethanol production. It was because of a historic drought in the corn growing area of the country. The drought last year rivaled the droughts during the Great Depression and the 1950's in severity. As the weather returned to a more normal pattern this past year, American farmers produced a record corn crop.

It is also worth noting that the men and women who produce livestock in this country weren't the only ones hit by the drought. Overall corn production for the 2012-2013 marketing year, the year of the worst drought in almost 60 years, declined by 1.58 billion bushels when compared to the 2011-2012 marketing year. Overall corn usage declined by 1.417 billion bushels. (USDA's March 10, 2014, World Agricultural Supply and Demand Estimates, page 12, http://www.usda.gov/oce/commodity/wasde/latest.pdf)

Corn used for ethanol production accounted for 352 million bushels, or 25 percent, of the decline while corn for exports accounted for 812 million bushels, or 57 percent of the decrease. Despite using roughly the same amount of the corn supply for ethanol production, corn used for animal feed declined by 222 million bushels, accounting for 16 percent of the production decline. 84 percent of the corn usage decrease in the wake of the worst drought in almost sixty years did not come from livestock feed, and nearly 100 million bushels of wheat was substituted for corn in livestock rations. By this objective, fact-based measurement using highly respected government source data, one could easily say that the ethanol industry was forced to cut back more than those who produce our nation's livestock. (USDA's March 10, 2014 World Agricultural Supply and Demand Estimates, page 12, http://www.usda.gov/oce/commodity/wasde/latest.pdf)

I would be remiss if I didn't note that every bushel of corn used for ethanol production returns one-third of that bushel back as a highly nutritious, high protein livestock feed called distiller's grains. For this year, Iowa State projects that the ethanol industry will produce enough distiller's grains to offset 1.176 billion bushels of corn. (http://www.extension.iastate.edu/agdm/crops/outlook/dgsbalancesheet.pdf)

Lastly, I wanted to address food price increases for consumers. In a May 2013 World Bank report on long-term food price drivers, they determined that more than 50 percent of the increase was because of crude oil prices, with stock-to-use ratios and exchange rate movements accounting for roughly 15 percent each. (http://www-wds.worldbank.org/external/default/WDSContentServer/IW3P/IB/2013/05/21/000158349_20130521131725/Rendered/PDF/WPS6455.pdf, Abstract). In addition, USDA estimated in 2011 that for every dollar an American spends on food, only 15.5 cents of that goes to purchase actual farm commodities. The lion's share 84.5 cents, goes for a number of marketing expenses, including packaging, energy, transportation, food processing, and advertising. (http://www.ers.usda.gov/data-products/food-dollar-series/documentation.aspx)

Questions from Senator Cardin:

1. ***Since corn is the common input in ethanol and poultry, and ethanol already has its suite of federal supports, what would you recommend Congress do to put poultry producers on equal footing with ethanol producers in the corn market?***

I have to respectfully disagree with the assumption that ethanol has a "suite of federal supports." The ethanol industry voluntarily gave up the Volumetric Ethanol Excise Tax Credit (also known as the blender's tax credit, which went to the oil industry) and a tariff on foreign ethanol at the end of 2011. And they never asked to extend them at that time. Currently, they have the same programmatic support as every other biofuel has with the Renewable Fuel Standard, including biodiesel, renewable diesel, biobutanol, and cellulosic ethanol – which has the exact same chemical composition and fuel properties as ethanol from corn, despite popular notion. The only federal support for ethanol production is through modest research and economic development investments that pale when compared to the support provided the poultry industry.

In fact, I would argue that poultry producers have a rather significant level of direct support within the federal government:

- Poultry products are required to be purchased under the school lunch program, that spends billions of dollars a year to feed millions of American school children.
- Poultry products are purchased by USDA under their section 32 purchasing authority, which purchases food products for the school lunch program and to reduce surplus production. Since fiscal year 2009, over $750 million has been spent to purchase chicken and turkey under section 32.
- Poultry producers are eligible for Environmental Quality Incentive Program (EQIP) payments to help them adopt new conservation practices. EQIP has provided billions of dollars in assistance over the last several years and the livestock sector is mandated to receive 60 percent of the funding available to this program.
- Poultry producers are eligible for export assistance programs at USDA such as the Market Access Program and the Foreign Market Development Cooperator Program.

2. ***Who does Growth Energy think should pay for assuring that fuel retailers can safely dispense fuel with higher blends of ethanol?***

Growth Energy filed the green jobs waiver 5 years ago to move our nation forward with E15. After running over 6 million miles of tests on 86 vehicles, the EPA in conjunction with the Department of Energy approved the use of E15 for all 2001 and newer vehicles – representing over 80 percent of the cars on the road today. E15 is a voluntary choice for both retailers and consumers. Since the waiver was enacted, retailers are offering E15 in more than a dozen states because it provides consumers a price competitive, cleaner fuel choice at the pump. E15 is safe and effective and is approved for nearly all fuel dispensing equipment manufactured since 2008. E15 is also covered under retailers' standard insurance liability coverage that applies to all gasoline fuels as it carries no more risk than any other fuel.

Questions from Senator Vitter:

1. ***General Clark, you've stated that grain and cellulosic ethanol "could be used all over the world to make developing nations energy independent – breaking the yoke of strongmen, rogue nations, and cartel-driven energy prices not just on our economy, but on the economies of those most vulnerable."***

How do you square that with the recent position taken by the Committee on World Food Security that the "progressive realization of the right to adequate food for all" should be a priority concern in biofuel development.

I believe blaming biofuels production for increased hunger misses the main driver of food cost increases – oil. In fact, I believe the U.S. has clearly demonstrated that the production of both food and renewable energy in substantial quantities and at reasonable prices can be achieved simultaneously. In a May 2013 World Bank report on long-term food price drivers, they determined that more than 50 percent of the increase was because of crude oil prices, with stock-to-use ratios and exchange rate movements accounting for roughly 15 percent each. (http://www-wds.worldbank.org/external/default/WDSContentServer/IW3P/IB/2013/05/21/000158349_20130521131725/Rendered/PDF/WPS6455.pdf, Abstract).

As for the Committee on World Food Security, their final report released last October contains a far more nuanced approach to biofuel development than this question raises. In particular, the report clearly indicates that there are number of other factors that impact food prices – not simply biofuels.

2. ***According to a recent UN hunger report, family farmers and those who depend on smallholder agriculture in developing countries account for more than 840 million suffering from chronic hunger around the world.***

   If land grabbing to grow fuel continues, the acreage available for smallholders to grow food is lost, resulting in increased food security.

   Do you think the Renewable Fuel Standard increases food prices throughout the world? The World Bank and USDA say the program has resulted in higher food prices globally. Do you have an idea of how many people are going to suffer from hunger and malnutrition as a result of this program?

As I said in the answer to my previous question, the real cost driver of higher food prices is oil – something that that World Bank report you reference above states in very stark terms. According to a May 2013 World Bank report on long-term food price drivers, they determined that more than 50 percent of the increase was because of crude oil prices, with stock-to-use ratios and exchange rate movements accounting for roughly 15 percent each. (http://www-wds.worldbank.org/external/default/WDSContentServer/IW3P/IB/2013/05/21/000158349_20130521131725/Rendered/PDF/WPS6455.pdf, Abstract).

Further, USDA estimated in 2011 that for every dollar an American spends on food, only 15.5 cents of that goes to purchase actual farm commodities. The lion's share 84.5 cents, goes for a number of marketing expenses, including packaging, energy, transportation, food processing, and advertising. (http://www.ers.usda.gov/data-products/food-dollar-series/documentation.aspx)

3. ***Even after extended correspondence and a brief discussion during the December 11, 2013, EPW hearing, you have yet to answer my key question regarding your visit to Louisiana on***

September 30, 2013, and your efforts to promote the wasteful government cell phone program, Lifeline. So, once again, I ask you:

Have you or any businesses or political PACs with which you are associated, including the veterans' organization that sponsored your Lifeline visit to Louisiana, been paid or hired by entities that benefit financially from the Lifeline program? If so, by whom, and how much have they received from the program?

I do not believe this is an appropriate question for a discussion of the Renewable Fuels Standard.

4. *Assuming EPA's waiver methodology is in place annually, if you had your choice between status quo or making reforms to the program, which would you choose?*

The RFS continues to be a highly successful program and has the necessary flexibility for EPA to examine volumes each and every year; however, EPA must follow the law and adhere to the statute that Congress enacted in 2007. Making legislative changes to the RFS would only endanger the significant investments already made in the over 200 ethanol plants and nearly 140 biodiesel plants across the country. It would also endanger the billions of dollars of investment being made in the next generation of biofuels and would only continue our dangerous addiction to foreign oil.

5. *General Clark, because EPA is proposing to basically freeze ethanol consumption at 2012 and 2013 level, Iowa state economists project that the EPA's action will have little impact. The cellulosic mandate is being more than doubled from 6 million gallons to 17 million gallons. From where do your predictions of plant closures and layoffs come?*

As part of Growth Energy's comments to EPA on the 2014 RFS proposed rulemaking, Edgeworth Economics studied this issue in depth. Their analysis can be found as exhibit 20 in our attached comments, the table from which is below:

Economic Impacts Associated with Closed Ethanol Production Facilities Caused by Waiver of the RFS Mandate in 2014
Decline in Ethanol Production up to 0.8 billion gallons
Impacts based on 0.8 billion gallon reduction
Number of Closed Facilities 11
Lost Revenues/Output at Closed Facilities $2.4 billion
Lost State/Local Tax Revenues $29 million
Reduced Employment at Closed Facilities 640 jobs
Overall Reduced Employment in Ethanol Producing Regions 2,560 jobs

Question from Senator Wicker:

1. *Can you please comment on whether blends of higher than 10% ethanol endanger small engines, such as those used by the U.S. Navy and Coast Guard?*

E15 is not federally approved for anything other than 2001 and newer passenger vehicles. While we believe ethanol poses very little risk to small engines, it is illegal to fuel boats, motorcycles, chain saws, and other engines with E15. As part of the E15, waiver EPA requires that fuel offerings be correctly labeled – a label that explicitly says that E15 is legal for 2001 and newer vehicles only. In some cases, EPA also requires a specific E10 pump on the premises specifically labeled for small engines, motorcycles, and other non-E15 approved engines.

Senator BOXER. Thank you, General.

Mr. Jim Collins, Jr., Senior Vice President, Industrial Biosciences, Performance Polymers and Packaging and Industrial Polymers, DuPont.

STATEMENT OF JAMES C. COLLINS, JR., SENIOR VICE PRESIDENT, DuPONT POLYMERS AND INDUSTRIAL BIOSCIENCES, E.I. DuPONT de NEMOURS AND COMPANY, INC.

Mr. COLLINS. Good morning, Chairman Boxer, Ranking Member Vitter and members of the Committee. I am pleased to be here with you today, and I will cover the significant investment that DuPont has made in biofuels and how we have contributed to the Nation's energy security, reducing greenhouse gas emissions and strengthening our rural economies.

Now, this technology does represent a tremendous shift in how we can energize our Nation as well as our planet. It is real, it is happening today and it is due to the Renewable Fuel Standard, a critical policy that must endure.

DuPont's commitment stretches across the country, from our laboratories in California to the cornfields of Iowa to our headquarters in Delaware. DuPont has invested hundreds of millions of dollars in scientific research. Through our seed business, we have optimized corn production, delivering more corn on the same amount of acres.

We have enzyme technology and work every day to improve the efficiency of existing ethanol facilities. And then we also produce enzymes that further improve the digestibility of feed products, or DDGs, that come from corn ethanol production.

So, all of these advances combined mean we are able today to produce increasingly more food, more feed and more fuel off of every acre.

But that is only half the story. With more corn comes more corn residue, the leaves and stalks and cobs that are left over after harvest. DuPont and others are building supply chains to harvest this residue and commercialize biofuels from this plentiful source of cellulose at scale.

Now today I can report that we are in the process of building a 30 million gallon facility in Central Iowa and we are on track to begin production next year. Upon completion, this plant alone will employ 70 full-time folks, it will pay over 500 local farmers for their biomass annually, and employ another 150 seasonal workers to collect, transport and help store this feedstock. And we will do this while remaining greenhouse gas neutral. Or, in other words, our supply chain meets a standard that other industries could never dream of achieving. It is fully sustainable and has a net zero CO_2 emission.

In addition to cellulosic, DuPont is also producing another advanced renewable fuel with our partner, BP, in a 50/50 joint venture we call Butamax. Now, this joint venture has extensively tested biobutanol. It is a higher energy alcohol fuel, is compatible with existing vehicles and existing infrastructure, and has twice the renewable energy content of E10.

So indeed, these are tremendously exciting technologies that are coming online and squarely put the U.S. in a leadership position

in the global biofuels market. If we stay the course, this technology really is just at its beginning.

We start today with biofuels. Using this technology we will be able to unlock sugars in cellulose, and tomorrow these same sugars and the same supply chains that we will be enabling can enable a whole new world of biochemical and biomaterials. Delivering on the promise of a bio-based economy.

Now, I firmly believe that reversing course on the RFS would have devastating effects. Short term it injects uncertainty into an improving economy. Medium term, it slows down the private, domestic investment that we will need to build plants two, three, four and five. Long term, we could find ourselves shipping these technologies, these jobs and, more importantly, these environmental benefits overseas to countries that have more stable policy environments.

That is why DuPont is particularly concerned with the EPA's recent proposed rule on the 2014 renewable volume obligations. We believe that these targets should be set in a way that drives higher overall blend use rates into the future, not the opposite.

Now, DuPont respectfully asserts that the Renewable Fuel Standard works well. Do not mess with it. Our industry is at a critical juncture where advanced commercial production is under construction and policy stability will significantly impact investments and the pace of that commercialization.

Thank you.

[The prepared statement of Mr. Collins follows:]

Statement of James C. Collins, Jr.
Senior Vice President
DuPont Polymers and Industrial Biosciences
E.I. DuPont de Nemours and Company, Inc.
Regarding Domestic Renewable Fuels
before the
Committee on Environment and Public Works
United States Senate
December 11, 2013

Good morning Chairman Boxer, Ranking Member Vitter and Members of the Committee. My name is Jim Collins and I am the Senior Vice President for DuPont's Polymers and Industrial Biosciences businesses. I am pleased to be here today to discuss our progress on renewable fuels. My testimony will cover the significant investment that DuPont has made in biofuels and how these investments have made transformative contributions to our nation's energy security, reduced greenhouse gas emissions and strengthened rural economies. This technology represents a tremendous shift in how we energize our planet. It is real, it is happening today and it is due in large part to the Renewable Fuels Standard (RFS), visionary legislation enacted by Congress a few short years ago and a critical policy that must endure.

DuPont Biofuels

Our deep commitment to biofuels stretches across the country from our laboratories in California, to the corn fields of Iowa and reaching our headquarters in Delaware. Through our seed business, DuPont Pioneer, our scientists work with farmers every day to optimize corn production. As breeding continues to advance, we are able to produce more and more corn on the same acreage. This additional feedstock, coupled with more efficient corn ethanol plants and optimized enzymes, means we're doing more with less in first generation ethanol.

To increase ethanol output per unit of grain, DuPont transforms feedstock and production. First, and most importantly, we continue to improve harvestable yield per unit of inputs. We also select certain seeds for ethanol yield potential and offer over 180 High Total Fermentables hybrids. Drought tolerant corn seeds are a reality and DuPont Pioneer has great success in drought tolerance breeding. While last year's drought was terrible, grain production would have been much lower but for superior genetics produced by companies like ours. DuPont also produces enzymes to further improve digestability of the valuable feed byproduct from corn ethanol production. All these advances combined enable more predictable corn production to deliver increasingly more food, more feed and more fuel per acre.

In addition to our per acre advancements to add more food, feed, and fuel there is another important point that should not be missed. The Renewable Fuels Standard has successfully brought on line conventional ethanol refining capacity that fulfills the volumes expected under the statute. We strongly support these volumes being included in total blended fuel offered to American consumers but current law does not anticipate any further conventional ethanol capacity being built. This means that, to whatever extent biofuels policies have influenced grain

prices, with yield increases and improving refining efficiencies, the standard will have a diminishing impact on grain prices.

But that is only half the story. With more corn, comes more corn residue: more leaves and stalks and cobs that DuPont and others are harvesting and with which we are building the infrastructure necessary to commercialize cellulosic biofuels at scale.

DuPont began its research into cellulosic technology a decade ago. What started as a lab scouting project grew into a full scale commercialization effort. In2009 DuPont opened a demonstration facility in eastern Tennessee producing cellulosic ethanol from both corn stover and switchgrass. For the past four years in Iowa, we worked closely with farmers, equipment makers and academia on corn stover harvest trials to build and manage a cost effective cellulose supply chain. All this work culminated in the groundbreaking of a 30 million gallon per year facility one year ago in central Iowa, approximately 40 miles north of Des Moines. I am happy to report that the construction is progressing on track and the facility is scheduled to begin producing its first gallons of cellulosic ethanol in the second half of 2014. When you look at the complex challenge before us – this has actually gone incredibly fast. . We had to unlock the sugars trapped in cellulose, biochemically convert them into advanced liquid fuel and create an entirely new supply chain to deliver this raw material with the economics capable of competing with fossil fuels. DuPont has over 200 years of bringing scientific innovation to market. We've never delivered this type of disruptive innovation so fast.

And fortunately for the industry, we are not alone. In addition to the cellulosic volumes that DuPont will bring to market, a number of other companies will do the same. Multiple companies are constructing, starting up or operating facilities producing renewable fuels from a wide variety of cellulosic feedstocks, including corn stover, switchgrass, wheat straw, municipal solid waste and wood fiber. Many of these are large, well-capitalized, sophisticated companies with long track records in designing, constructing and operating manufacturing facilities. This diversity of operations virtually guarantees multiple technologies succeeding at commercial scale. As was seen for grain ethanol, we anticipate that cellulosic renewable fuel production will expand quite rapidly once technologies have been proven at commercial scale.

In addition to cellulosic ethanol, DuPont is pursuing the commercialization of another advanced renewable fuel with our partner BP in a 50/50 joint venture called Butamax™. The joint venture has developed and extensively tested biobutanol, a higher alcohol fuel produced much like ethanol. Biobutanol has excellent fuel properties and gives higher mileage than ethanol. It also reduces the volatility of fuel blends, and so can be used where summer air quality concerns persist. It can be distributed by existing gasoline infrastructure, including pipelines. Lastly, biobutanol is more compatible with existing equipment, including small engines and marine engines. Butamax is constructing the first phase of a retrofit of an ethanol plant in Lamberton, Minnesota which after a two phase construction process will be producing commercial scale biobutanol by 2015.

Biobutanol's properties create totally new opportunity in the entire fuel system. It can improve refining economics as butanol requires a fossil blendstock that is easier to make.

It overcomes what oil companies call "the blendwall": Simply put, a butanol gasoline blend meets E10 fuel specifications and is compatible with existing vehicles and infrastructure, but has twice the renewable energy content of E10. This can be achieved by retrofitting existing ethanol plants into biobutanol facilities.

Indeed, these are both tremendously exciting technologies coming online that will squarely put the U.S. in a leadership position in the global biofuels market. But Members of the Committee, if we stay the course, this technology is just the beginning. Here is where it gets truly exciting. Let me explain.

We start witb biofuels. The technology to unlock the sugars in cellulose and the supply chains being developed to deliver those sugars at scale are enabling the commercial deployment of cellulosic ethanol today. Tomorrow, these same sugars and supply chains will be enabling a whole new world of bio-chemicals and materials, delivering on the promise of a truly bio-based economy.

Background on the RFS

Six years ago, the RFS set us on a path toward cheaper, more diverse and cleaner fuels. In the years since, the RFS has made homegrown renewable fuel 10 percent of our nation's gasoline supply, lowered greenhouse gas emissions by 33.4 million metric tons, added $500 billion in value to America's farmlands, lowered gas prices by $1.09 per gallon and created a real choice for consumers at the pump. DuPont, along with others, has led in that transition, investing hundreds of millions of dollars in reliable, environmentally responsible and homegrown feedstocks for fuel production. No other policy or technology has driven a more dramatic shift toward cleaner transportation than the RFS.

First generation biofuels have had a significant impact on an improved agriculture economy and also has increased farmer spending power. This translates into jobs – including additions at DuPont Pioneer, an improved tax base, and increased energy security. With the construction of our cellulosic plant, we are about to unleash a new round of biofuels expansion resulting in all of the benefits that accrue to rural economies.

When enacted, the objectives of the RFS were to reduce dependence on foreign sources of crude oil, reduce greenhouse gases and promote domestic rural economies. Over the past few years, the RFS has done all of that and done it exceedingly well.

The fuels of the future are here today, and we can thank Congress for enacting the bi-partisan 2007 energy bill containing the RFS2. This policy has brought us to the point where the first commercial facilities producing cellulosic renewable fuels are up and running, and several more are under construction. As a result of this innovative policy, the U.S. is the world leader in biofuels and is attracting billions of dollars of private-sector investment from all over the world.

The first chapter of the RFS has seen renewable fuels grow to play a substantial role in our fuel supply. The next chapter of the RFS will bring advanced and especially cellulosic renewable

fuels made from residues such as agricultural and wood waste and trash. That commercialization is under way but only if Congress stands strong with its commitment made to the private sector under the RFS.

Across the United States and around the world, innovative companies are investing heavily — to the tune of over a billion dollars of private capital — to build the first wave of commercial scale facilities. These facilities will bring the technology to market to help enable fossil fuel independence. Farmers are preparing to supply these plants with the cellulosic materials they will convert to fuel. Steel is in the ground, and construction workers and farmers are on the job. These plants hold the promise clean, renewable fuel at large scale and improving energy and economic security while achieving significant environmental benefits. Over the next several years, cellulosic renewable fuel can grow into a sizable American commercial industry with over 400 million gallons per year projected globally by 2020.

Defending the Renewable Fuel Standard

The RFS works well. Reversing course on the RFS would deny the country of a true alternative fuel with real climate benefits and economic upside for consumers and producers across the U.S. It would be a mistake to in any way alter the RFS which would certainly result in the United States losing its lead in the development of advanced renewable fuels. A change in this bedrock policy will assure that investors and entrepreneurs step back and wait to see how a new policy will develop, while they take their investments and resources elsewhere. Without the RFS, America can be all but certain that investment in advanced renewable fuels like cellulosic and biobutanol will halt for at least a generation.

That is why DuPont is particularly concerned with the EPA's recent proposed rule on the 2014 Renewable Volume Obligations (RVOs), which would move us backward through setting production targets lower than what the U.S. has currently been blending and lower than the amount of renewable fuel that can be produced on both the cellulosic side and the traditional corn ethanol side. We believe that as this Committee conducts oversight on the administration of the RFS, it must encourage that RVOs be set annually in a way that drives higher blend use rates into the future. DuPont believes that the EPA should set the RVOs to sustain demand for Renewable Identification Numbers (RINs) in order to create the right incentives for bringing higher blends of fuel to the marketplace. Ethanol blends of E-15 and E-85 are coming on-line, particularly in the Midwest, and the USDA and Secretary Vilsack have put a grant program in place to assist station owners with installing blender pumps. Initiated in 2011, the goal was to install 10,000 new blender pumps by 2016. Since the program's inception, we believe that refiners have resisted the movement to higher blends of ethanol. In August, Senators Grassley and Klobuchar sent a letter to Attorney General Eric Holder and FTC Chairwoman Edith Ramirez requesting an investigation because of allegations that oil companies are "blocking the use of the current retail infrastructure to sell renewable fuels." The RFS, if maintained as an increasing standard, will generate the RINs to give innovative refiners the right reward for developing efficient routes to market for renewable fuels. There is factual evidence that this approach is works. A recent Reuters news article quotes Steve Walk of Protec Fuel on the impact of the Administration's RVO proposal. "It was just starting to get to the point where oil

companies were saying, 'We'll start putting in alternative fuels,'" says Walk, who went on to say that the deal with two large oil refiners was put on hold.

Other analysis showed that in Minnesota this past summer, as RIN values began to rise, E-85 sales volumes increased significantly in a very short amount of time based on price. This did not require additional vehicle sales as many people already own flexible fuel vehicles and was also not related to other policy changes. I have included further analysis on the impact of RIN's on higher renewable fuel blends for the record.

More renewable fuel and higher RIN prices do not result in higher retail gas prices, but in fact lower retail gas prices. RINs are free for those that blend renewable fuel. Purchasing RINs is optional and only required for those that don't want to blend renewables. There is plenty of ethanol capacity in the market, it is less expensive than gasoline, and studies have shown that renewable fuel reduces gas prices overall by more than $1.00 a gallon.

If the RFS is administered in a way that keeps RINs cheap, then there will not be an incentive to create an efficient route to market for renewable fuel.

Greenhouse gas emissions, Sustainability and Efficiency Improvements

The RFS is the only existing climate policy contributing significantly to reducing our greenhouse gas footprint, and making our transportation fuel supply more sustainable. Both President Obama and Bush committed to greenhouse gas reduction goals. The RFS is making significant strides in lowering emissions and will help meet these goals –while other means of reducing CO2 remain stalled in Congress or stuck in the courts. The cellulosic plant DuPont is currently building in Iowa will be GHG neutral – or in other words: our supply chain meets a standard that the oil industry cannot meet. It is fully sustainable and has zero net CO2 emissions.

A peer reviewed life cycle assessment from field to wheel of the DuPont cellulosic biorefinery and supply chain indicates a potential greater than 100 percent reduction in greenhouse gas emissions compared to gasoline. This is because cellulosic co-products are also a source of renewable energy. The DuPont biorefinery co-product can displace coal in facilities currently burning this fossil fuel. Regional businesses and academic institutions have already indicated interest in exploring the potential use of the renewable co-products to replace portions of their coal fired operations.

Another benefit to DuPont's involvement in the entire biofuels supply chain is that sustainability and efficiency improvements are not limited to greenhouse gas emissions. Equally as important, are the contributions that our enzymes business makes to reducing animal feed costs on the order of $5 to $20 per ton, improving nutrient digestibility of animal feed and animal gut health. This improved digestibility results in both a reduction in the amount of manure and a better balance of nutrients in the manure which minimize the environmental impact. DuPont scientists continue to research ways to further maximize the contribution of every corn kernel with the goal of using all the nutrients as efficiently as possible and returning any unused portion back to the nutrient cycle. Dry and wet distiller's grains are recycled to animal feed and DuPont enzymes are added to optimize the nutritional value to the animal. For example, DuPont's phytase enzyme improves

the nutritional value of feed by unlocking the phosphorus tied up by phytic acids in plants. This enzyme also reduces the need to add organic phosphate to feed which is an added cost to the farmer and results in higher phosphorous levels in manure and run-off. Other DuPont enzymes, xylanase, amylase and protease, help digest other nutrients in feed further reducing feed costs and improving animal performance. These are just a few examples of how DuPont is optimizing animal feed through science and research to maximize the use and benefit in every kernel.

DuPont and USDA Memorandum of Understanding

A bio-based economy depends on the gifts of Mother Nature being around for the long haul. This past March, I had the pleasure of joining U.S. Department of Agriculture Secretary Tom Vilsack in Iowa as we announced a Memorandum of Understanding (MOU) between DuPont and the USDA to work towards voluntary standards for the sustainable harvesting of agricultural residues for renewable fuel. DuPont's comprehensive, sustainable farm to fuels approach for corn stover set the stage for this agreement with the USDA's Natural Resource Conservation Service. The agreement will facilitate conservation planning assistance for farmers who supply bio-based feedstocks to biorefineries as the industry begins to commercialize. A conservation plan is voluntary, developed in cooperation with farmers, and helps protect natural resources while promoting a farm's sustainability.

Through the MOU, DuPont will develop a process to work with cooperating farms to execute sustainable harvest practices that will keep soil and nutrients in the field and out of rivers, streams and lakes. This work will promote a healthier soil which reduces flooding through increased infiltration rates, and provide for the efficient use of nutrients preventing the need for additional fertilizer.

This is a critical step forward in the development of the cellulosic biofuels industry as numerous players rally with farmers to undertake these novel feedstock supply chains. Harvesting stover residue sustainably is not just the right thing to do for the stewardship of our fertile heartlands – it is also a business critical imperative if we hope to maintain the renewable raw materials to supply biorefineries for decades to come.

Conclusion

In 2007, Congress reaffirmed a policy commitment originally made in 2005 to include energy options broader than petroleum in our nation's transportation sector. Congress made these bold commitments for a host of reasons including energy security, environmental improvements and economic development among others. These objectives still stand, even as our nation is increasing energy production on many fronts, as a growing world population and energy consumption will increasingly stress traditional energy sources. Congress was wise to invest in a broad portfolio of energy options now to guard against economic impacts of the future.

In making these policy choices, Congress also set a course for business investment. DuPont has invested significant capital and is on track to meet the demands of the RFS. Changes in renewable fuels policy may put these investments at considerable risk and inject uncertainty into an improving economy. While some members of this committee may view biofuels with

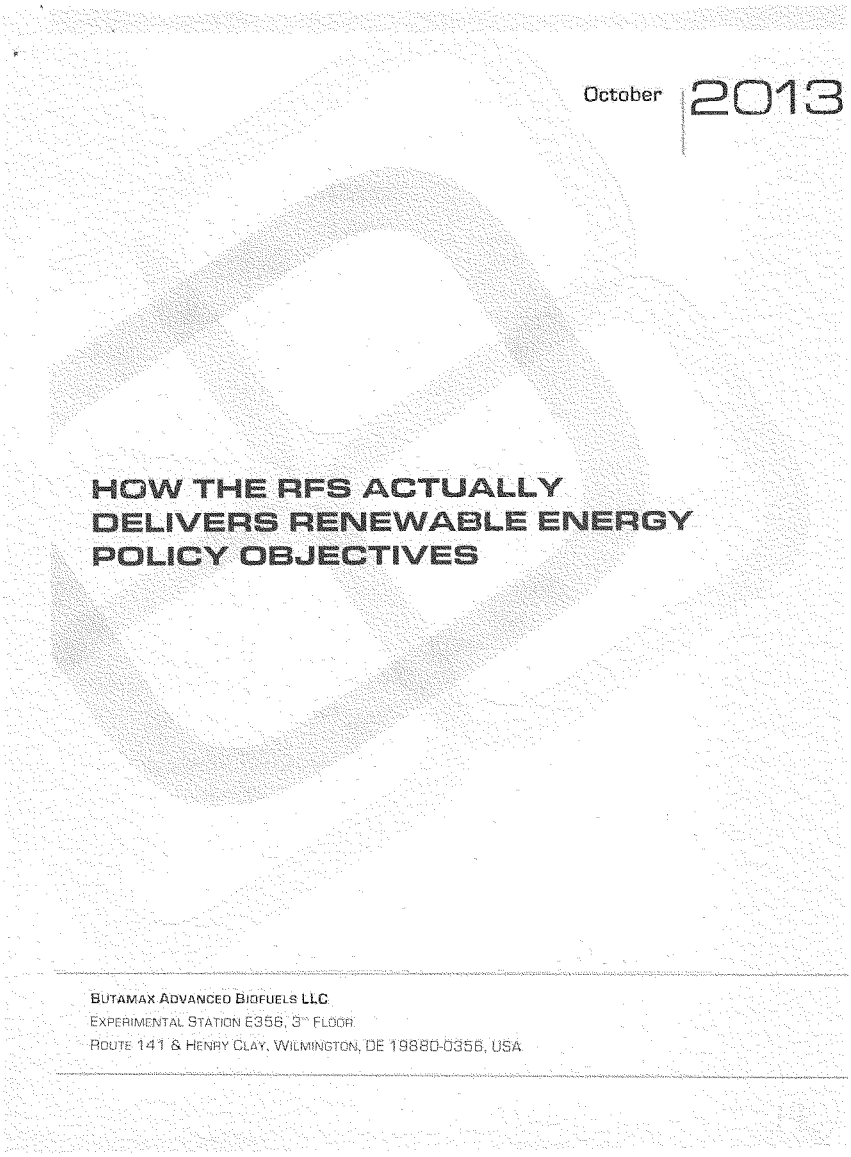
skepticism, I hope that you would agree that DuPont and other businesses investing in a policy set forth by Congress should not have the rules changed mid-course.

The biofuels industry has met the Congressional call for conventional biofuels ahead of schedule. As we move to advanced biofuels, the technologies for converting cellulose to fuel exist today and other renewable fuel choices are around the corner. The plants that harness these transformative technologies are being constructed. We sit at a critical juncture as farmers are harvesting feedstock now for commercial cellulosic ethanol production next year, based on the RFS. Without policy stability, growth of the advanced biofuel industry, as Congress intended, will not happen. That means lost jobs, lost economic development, lost energy security and lost environmental advantages.

We firmly believe that Congress has the responsibility to examine policies, and when appropriate, correct unforeseen consequences of previous decisions. While we appreciate the opportunity to participate in this oversight process, DuPont respectfully asserts that the Renewable Fuels Standard works, and importantly, the industry is at a critical juncture where advanced commercial production is under construction and policy decisions will significantly impact investments.

Specifically, DuPont commits to continue to inform and respond to this committee regarding the progress of our investments in biofuels, and invite each member of this committee to join us at our sites associated with biofuel production. However, we request that this committee also acknowledge the commitment made by Congress and the importance of policy certainty to investment in the technology we, and other companies, are deploying. In addition, in an oversight capacity, we ask this committee to work to make certain the RFS is administered in a way that ensures the Congressional goals of higher biofuels blends, advanced biofuels investments, and the realization of greater energy security through diversity of options.

Thank you, again, for this opportunity to address this committee. I would like to also take this opportunity to invite each of you to visit our biofuel production facilities to more thoroughly understand the importance of the Renewable Fuels Standard to achieving our national goals.


October 2013
HOW THE RFS ACTUALLY
DELIVERS RENEWABLE ENERGY
POLICY OBJECTIVES
BUTAMAX ADVANCED BIOFUELS LLC
EXPERIMENTAL STATION E356, 3RD FLOOR
ROUTE 141 & HENRY CLAY, WILMINGTON, DE 19880-0356, USA

Butamax™

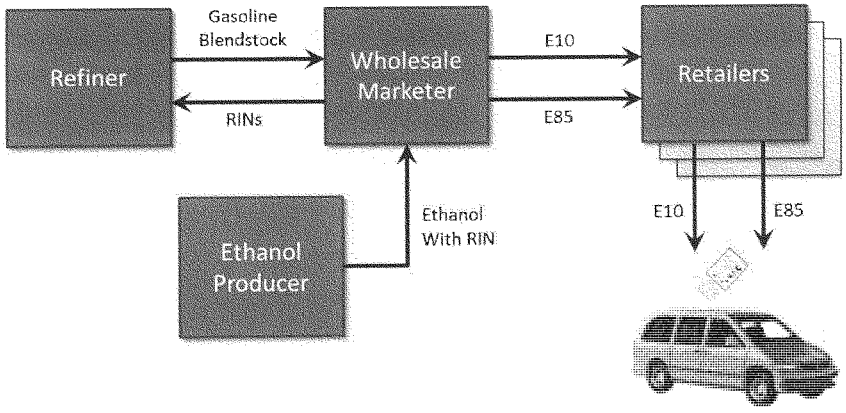
HOW THE RFS ACTUALLY DELIVERS RENEWABLE ENERGY POLICY OBJECTIVES

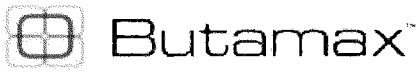
Jane Q. Public drives her flex fuel vehicle (FFV) in to her local gas station, checks the prices, enters them into a smart phone app and is advised that she should purchase E85 today. Many of her fill-ups lately are with E85. She chooses E85 for one basic reason, cost. Aside from cost, her vehicle works exactly the same on E85 or E10. This simple act, multiplied by millions of FFV owners and thousands of gas stations offering E85 are the key to how the biofuel targets of the Renewable Fuels Standard 2 (RFS) can be met. They can be met with vehicle types already on the road, retail equipment already available and under current law as written.

A number of critics have suggested that the RFS is flawed, broken or infeasible and therefore must be either substantially re-written or simply abolished. We emphatically disagree. In fact, we assert the RFS is working as designed and the goals of the RFS are being realized. Recent proposals to reduce biofuel blending targets are fundamentally at odds with the objectives of the RFS and must be reconsidered. This paper provides a detailed explanation of how the mechanisms within this legislation are successfully working as intended.

THE FUEL VALUE CHAIN AND RFS REQUIREMENTS

An understanding of the RFS first requires an understanding of the roles of the different entities in the fuel supply system and how their activities are interconnected. The accompanying figure provides a simplified illustration to support this discussion.





The system shown above provides incentives for all players in value chain to allow RFS2 compliance to be achieved. For a refiner, as their renewable volume obligation (RVO) increases, they will need to acquire renewable identification numbers (RINs) generated from blending in order to be able to supply gasoline blendstock. The cost of these RINs will be reflected in the price of gasoline blendstock offered to wholesale marketers, since it is part of the "license" to supply gasoline. For wholesale marketers, generation of RINs will be a core requirement for them to be able to source gasoline from refiners. Once the E10 blend wall is reached, the immediate option for wholesale marketers to increase supply of RINs (beyond that which is possible with E10 alone) is to blend and sell E85 to retailers. Wholesale marketers will be incentivized to do this because of the value of the RINs generated, and retailers will be incentivized to offer E85 because of the opportunity to sell a growth product which offsets declining gasoline sales. Retailers will need to install appropriate dispensing equipment to allow them to do this and will need to price it attractively to consumers to generate demand. RINs are the mechanism that allows this to happen; the price of a RIN will rise to the level needed for the wholesale marketer to price E85 attractively to the retailer and for retailers to price E85 attractively to consumers. These factors work together to incentivize generation of the number of RINs required by refiners. As will be discussed throughaut this document, all of this can be achieved without significant impact on retail gasoline prices.

While some commentators have suggested the recent increase in the price of RINs is indicative of fundamental problems with the RFS, in fact the complete reverse is true. It is clear evidence that the mechanism designed to stimulate compliance with RFS targets works in exactly the way that was intended. RINs create the required incentives throughout the value chain to cause unrelated parties to work in concert to deliver the legislated targets. More detail on the roles of each of these parties is provided in the Appendix.

ACTIONS REQUIRED TO DELIVER RFS

Much of what has been written about the RFS focuses on the refiner (who, as the obligated party, has a very large stake) or the ethanol producer (generally seen as the principle beneficiary of this law). The role of the retailer is often ignored, yet they are the key – the goals of the RFS will only be realized if retailers offer and consumers purchase the mix of fuels necessary for refiners to achieve compliance. The RFS, between the statutes and the implementing regulations, is prescriptive on the requirements placed on refiners as well as the qualifications and actions of biofuel producers. The RFS is deliberately non-prescriptive in terms of fuel types and formulations. The intent of this structure is to avoid picking winners and losers in an area characterized by technology that is evolving rapidly. Butamax has been leading this innovatian with the development of technology to produce biobutanol and introduce it to the fuels value chain. Making this mix of

prescriptive and non-prescriptive elements work requires a focus on the fuel needs of the consumer.

For the scenario envisaged at the start of this paper to be realized, E85 will need to be increasingly available at retail and offered at prices which make it economically attractive for FFV owners. We focus on E85 because it is matched with the designed capabilities of the existing FFV fleet and its high ethanol concentration enables RFS requirements to be achieved with a smaller and more gradual deployment of new E85 installations and FFVs than would be possible with mid-level ethanol blends (e.g. E30). Other types of biofuels (sometimes referred to as "drop in fuels"), such as biobutanol, which do not require new retail infrastructure are expected to be an important and growing part of the market. While it could ultimately become material in the market, E15 alone will not be sufficient to meet the intent of the RFS. E85, on the other hand, represents a cost-effective fuel blend, immediately available for market deployment, with potential to underpin the full objectives of the RFS. Accordingly, E85 should be considered as a core component of any RFS compliance strategy. E85 also has the added benefit that it is complementary to new drop-in biofuel technologies, enabling them to develop in the market as their cost performance improves.

Building increased retail availability of E85 at attractive prices requires several factors:

- **GROWING THE NUMBER OF E85 INSTALLATIONS** – Currently, there are about 3000 gas stations in the US offering E85[1]. It is estimated that 80% of FFV owners live within 10 miles of an E85 station. Nonetheless, in order for E85 to have the necessary impact on fuel markets, the availability will need to grow. These 3000 stations demonstrate that retailers will invest if they see market demand. With store sales being an increasingly important driver of station profitability and declining fuel volumes retailers may find that they need to offer new fuels if they are to retain the store traffic required for station profitability. With refiners needing growth in E85 sales volumes to supply a growing RIN obligation, they are incentivized to make commercial arrangements with blenders and retailers which will facilitate a growing retail E85 presence.

- **ATTRACTIVE E85 PRICING TO CONSUMERS** – E85 has only recently started to draw mainstream consumer interest in the US because it has not previously been priced at a level which reflects its reduced fuel economy compared to E10. Market data from Brazil, where FFVs are widely available (90+% of new car sales for the past decade have been flex fuel vehicles) and high ethanol content fuel is universally

[1] Babcock, B.A., and S. Pouliot. "Price it and They Will Buy: How E85 Can Break the Blend Wall." Policy Briefing Paper 13 PB-11. Center for Agricultural and Rural Development, Iowa State University.

available at retail, shows that FFV owners will buy this fuel if it is readily available and priced appropriately relative to gasoline. The same result can be expected in the US once consumers are familiar with the benefits of E85 and it is priced consistently with the fuel economy delivered.

Retailers can only offer an attractive E85 price to consumers if they are able to purchase E85 at a price which allows them to make that offer while earning a profit margin similar to that which they earn selling E10. As the wholesale marketer also has no RFS obligation, they will require the value of the RINs they capture (through blending of E85) to be sufficient to enable them to price E85 at the level required by the retailer. In fact, if E85 is the marginal source of RINs for the refiner, as can be expected when RVOs exceed RIN supply from E10 alone, the market value of RINs will continuously adjust[2] to enable the wholesaler to offer this pricing while earning a normal profit margin. As Jane and her fellow FFV owners will vary somewhat in how they assess E85 prices, wholesale marketers and retailers will learn to adjust their E85 price to move their sales mix as needed to balance with refiner demand for RINs.

- **MAINTAINING AND GROWING THE NUMBER OF FFV'S** – The current FFV fleet in the US is estimated at about 14 million vehicles. Historically, automobile companies have produced these vehicles in the general absence of material consumer demand because they earned the manufacturer credits towards their compliance with fuel economy (CAFÉ) standards. With the opportunity for CAFÉ credits being reduced, there is a risk that automobile companies will begin to scale back their FFV offerings unless consumer demand or other incentives make this attractive.

Wholesale marketers have incentive to maintain and grow their fuel sales volumes in a shrinking gasoline market and they have an opportunity to grow their RIN sales by blending increasing volumes of biofuels. Moving greater volumes of high biofuel blends, such as E85, requires them to secure demand from retailers with E85 capability and to price the E85 at levels which will enable retailers to profitably grow their E85 sales volumes. This will typically require wholesale marketers to transfer much of the RIN value to the retailer by way of a lower E85 price, so that retailers, in turn, can pass it on to the consumer. With E85 as the marginal source of RINs, market forces will drive RIN values to levels which enable the wholesale marketer to profitably price E85 at levels which incentivize retailer demand. While widespread adoption of this strategy may take some time, there is already evidence of the market responding to the incentive created by the market need for additional RINs.

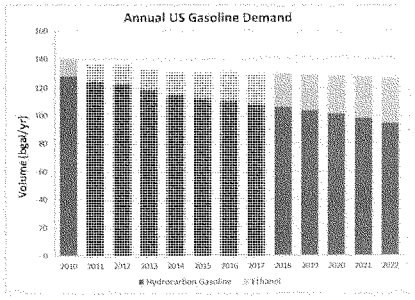
[2] RIN values are expected to decrease when gasoline prices rise relative to ethanol and decrease when gasoline prices fall relative to ethanol.

Butamax™

In summary, E85 must be viewed as the core mechanism for delivery of the RFS in the near term. It plays this role because it is an existing product with a substantial base of compatible vehicles and retail infrastructure. Accordingly, it offers the most immediate opportunity to greatly expand the RIN supply to the market. Growth of E85 demand has historically been impeded by retail pricing at levels above its value to most consumers. The RIN mechanism of RFS changes this by providing economic incentive for all parties in the value chain to align in a manner which grows E85 availability and supports retail pricing that can stimulate the required levels of consumer demand. The RIN mechanism also serves to incentivize commercialization of drop-in biofuels such as biobutanol. These fuels will serve to enable deeper penetration of biofuels through their enhanced RIN delivery and full compatibility with existing, non-FFV, vehicles and retail infrastructure. Conversely, modifications to RFS which reduce RIN prices will reduce costs to refiners but will also eliminate incentives for wholesale marketers, retailers and consumers to grow E85 markets or deploy drop-in biofuels.

IMPACT ON THE MARKET AND GASOLINE PRICES

The underlying aim of the RFS is to grow the share of domestically produced renewable fuels in the US fuel market. The key benefits from this action are improvements in US energy security, improvement in air quality (both traditional pollutants and greenhouse gas emissions) and moderation of the growth in global oil demand. This is being done in a context where US gasoline demand is gradually decreasing as a result of demographic shifts, economic factors and gradual improvement in fuel economy standards for new cars. While the RFS is applicable to both the gasoline and diesel fuel markets, this paper focuses on the gasoline market as it is larger and the transition issues are more complex. In the case where ethanol is the dominant renewable gasoline component, analysis of the projected US gasoline market[3] and the gasoline portion of the RFS[4] requires that ethanol takes a growing share of a declining US gasoline market, as illustrated.

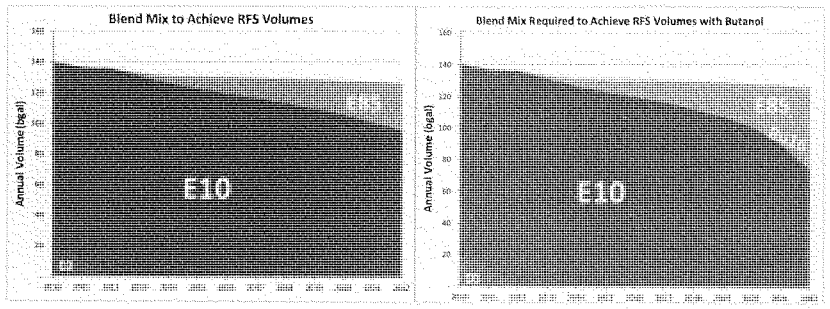


[3] Butamax analysis, based on projected US gasoline and E85 demand from the US Energy Information Agency (EIA) Annual Energy Outlook for 2013 (AEO2013) reference case.

[4] Butamax assumes that the biomass-based diesel portion of the RFS gradually increases from the 1.28bgal requirement for 2013 and subtracts this contribution from the Total Renewables requirement.

Butamax™

Delivery of this growing quantity of ethanol to the gasoline market requires a shift to higher ethanol blends. For simplicity, we assume that the US market first transitions away from straight gasoline (E0) to E10, a step which has already largely occurred. From there, E10 is gradually displaced by growing volumes of E85. As discussed above, delivering this result requires retail pricing which incentivizes FFV owners to regularly purchase E85, as well as growing the FFV share of the vehicle population and increasing retail availability of E85. With those enabling requirements in mind, the accompanying chart estimates the share of E0 and E85 in the market required to generate the quantity of RINs implied by full RFS implementation. (Sales of E15 or other types of biofuel would directionally reduce the amount of E85 sales required). As illustrated, the required ethanol volume share grows from about 8% in 2010 to over 25% in 2022, E0 virtually disappeared by 2012 and E85 slowly grows to 24% of fuel sales by 2022. E0, in fact, has continued in the US market at low levels as biomass-based diesel and some E85 sales have contributed to the fuel mix and generated RINs to enable RFS compliance. A slower ramp-up of the RFS obligation due to cellulosic ethanol coming to market more slowly than statute would also reduce the required rate of E85 penetration.

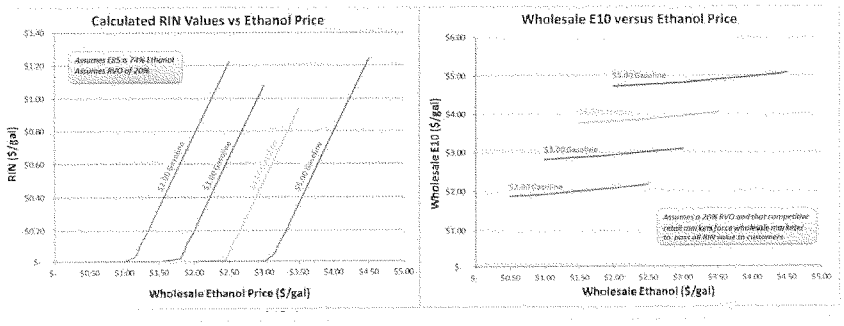


Drop in biofuels, such as biobutanol, provide an opportunity to further reduce the amount of E85 and, therefore, FFV's needed to achieve the RFS targets while staying within the capabilities of the existing vehicle fleet and infrastructure. A 16% blend of butanol in gasoline (Bu16) offers consumers the same fuel economy as E10 while generating twice the number of RINs per gallon as E10[5]. The accompanying chart uses the same fuel energy demand data as the prior chart while assuming the gradual introduction of butanol capacity (from either retrofit of existing ethanol plants or new construction of cellulosic butanol plants) of 4bgal/yr by 2022. In this scenario, required E85 volumes are reduced as butanol blends double the number of RINs which can be realized with fuel for standard vehicles.

[5] 10% ethanol X 1 RIN per gallon of ethanol generates 0.10 RIN per gallon of E10. 16% butanol X 1.3 RIN per gallon of butanol generates 0.21 RIN per gallon of Bu16.

Butamax™

While delays in commercialization of cellulosic ethanol technology or different levels of penetration of non-ethanol biofuels, (such as biobutanol or biomass-based diesel), may result in a shift of both the timeline and the amount of ethanol penetration required for RFS compliance, RIN prices will be set by the marginal source of compliance. We believe that, once RFS requirements exceed what can be achieved by E10, E85 will be the marginal source of compliance. The RIN will price at the level required to incentivize FFV owners to regularly purchase E85; for the large majority of such motorists that will require reducing the retail price of E85 to the level where the cost per mile is less than or equal to the cost per mile for consuming E10[6]. The RIN value necessary to achieve this retail pricing will be set by the delivered wholesale cost of ethanol and hydrocarbon gasoline respectively, as well as applicable state and local taxes in a given market[7]. The net effect of this structure is that the RIN moderates the terminal rack price of E10 (see charts below) and enables the terminal rack price for E85 to be sufficiently discounted to incentivize broad use by FFV owners. (This analysis does not assume any reduction in crude price levels due to displacement by renewables; such effect would further mitigate any price impacts on gasoline).



The manner in which these effects can be expected to appear in the marketplace is illustrated in the following examples.

[6] Babcock (Babcock, B.A., and S. Pouliot. "Price It and They Will Buy: How E85 Can Break the Blend Wall." Policy Briefing Paper 13 PB-11. Center for Agricultural and Rural Development, Iowa State University.) Provides a more rigorous analysis which infers a demand elasticity for E85 based on consumer behavior in Brazil. The result of that analysis is that steadily larger E85 discounts, and thus increasing RIN prices, are needed to support increasing E85 market share. We agree in principle with his analysis but have chosen not to analyze to that level of detail for this paper.

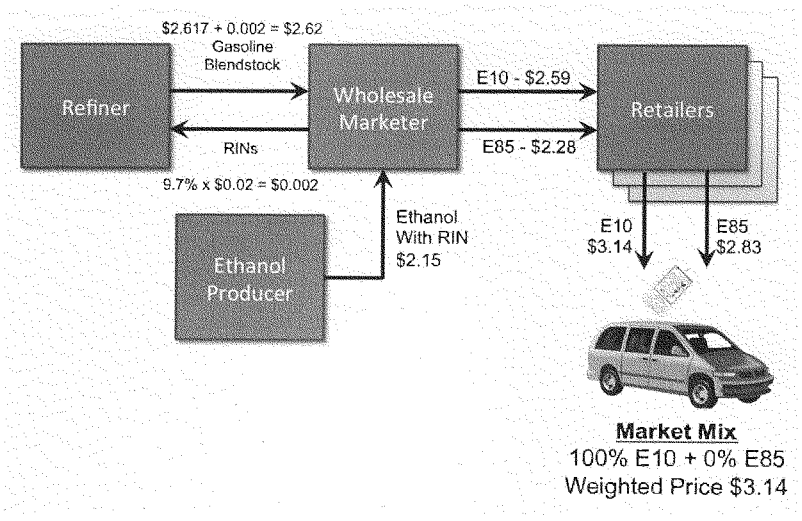
[7] As RINs trade on a national market, it will actually be the highest cost market which will determine the national market value of RINs. The location of this highest cost market will be determined by local delivered bulk ethanol price relative to local delivered bulk gasoline price as well as local tax structures.

Butamax™

Case 1 – RVO set at 9.7% of Gasoline Production (below blend wall)

A recent[8] New York Harbor (NYH) spot price for reformulated gasoline blendstock (RBOB), the gasoline product produced by refiners for blending into E10 for the New York market, was $2.64 per gallon. Deducting any charges related to RFS obligations, this equates to $2.617.. On that same day, the spot ethanol price (which includes one RIN) was $2.15 per gallon.

Now assume that the RFS obligation is maintained at 9.7% in perpetuity, so that there is no regulatory need for E85. This would cause RIN prices to drop to historic levels, assume $0.02. If refiner's costs remain the same as current market conditions, the spot RBOB price should go to the $2.617 /gallon calculated above plus a reduced RIN cost of 9.7% X $0.02 = $0.002 /gallon, for a total of $2.62 /gallon. Using the current ethanol price ($2.15/gal) and typical values for fuel taxes, transportation costs and margins, the flow of prices through the marketing system, expressed in $/gallon, can be estimated as illustrated below –



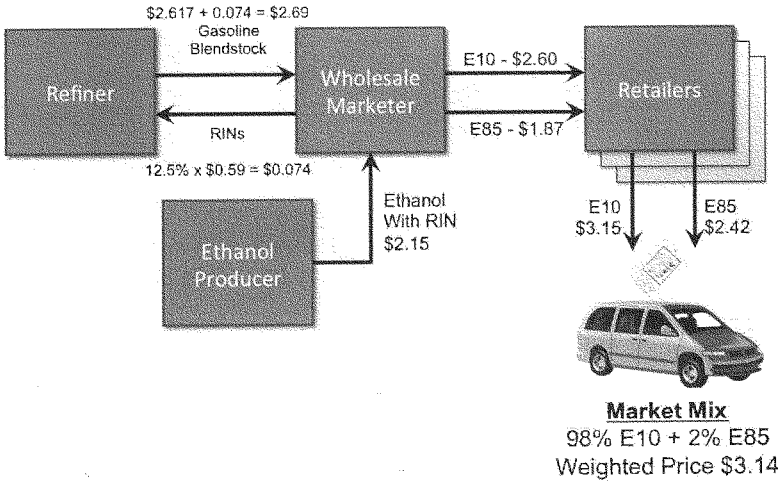
In this scenario, RIN cost has a minimal impact on refiners' cost of supplying the market and the expected retail pricing relationship between E10 and E85 (E85 at about 10% less than E10) is not likely to incentivize any significant E85 sales through existing pumps or installation of new E85 pumps.

[8] October 25th, 2013. The quoted price for a 2013 corn ethanol RIN was $0.24 and the current RIN obligation is 9.7%. Assuming that refiners are passing all of their RIN costs on to their customers, that amounts to 9.7% X $0.24 = $0.023 per gallon of RBOB. Thus, we can infer that the spot price of RBOB would be $2.640 - $0.023 = $2.617 in the absence of any RFS obligation.

Butamax™

Case 2 – RVO set at 12.5% of Gasoline Production (above blend wall)

In this case we assume the RFS obligation increases to the equivalent of ethanol at 12.5% of the refiner's gasoline production. This is roughly what would be required if the 2014 statutory obligation of 18.15 billion gallons were to be enforced with 1.28 billion gallons of biodiesel required. With this requirement and the same market environment as in Case 1, the retail market would need to sell 98.3% E10 and 1.7% E85 to generate the required number of RINs. We estimate that RIN prices would need to increase to $0.59 to enable retail E85 to be priced at levels which will incentivize this amount of consumer demand. This price level for RINs amounts to $0.074 per gallon of RBOB (12.5% X $0.59 = $0.074). This also lowers the effective cost of ethanol to the wholesale marketer to $2.15 - $0.59 = $1.56 per gallon. As a result, costs now flow through the distribution system as illustrated below –



The net result is that retail E10 prices are projected to essentially unaffected, rising from $3.14 in Case 1 to $3.15 in Case 2 while E85 price decreases from $2.83 to $2.42. This pricing relationship between E85 and E10 at retail is expected to incentivize the required consumer demand for E85. It should be noted that the market-weighted price mix remains unchanged at $3.14 per gallon. This level of E85 demand can be accommodated through the existing 3000 E85 pumps plus new pumps which retailers can be influenced to install when they see that there will be a consistent policy in place to incentivize consumer demand.

CONCLUSIONS

- The Renewable Fuels Standard is a farsighted and robust piece of legislation prompted by sound government policy. To quote the EPA "RFS2 lays the foundation for achieving significant reductions of greenhouse gas emissions from the use of renewable fuels, for reducing imported petroleum and encouraging the development and expansion of our nation's renewable fuels sector". It has successfully stimulated massive private investment in technology to create new, clean and diverse sources of renewable energy and superior fuel molecules for the US fuels market. The technology challenge has been considerable, but this investment has successfully delivered game changing technologies that put the U.S. firmly ahead of the rest of the world in the vital renewable energy sector.

- As the blend wall approaches, the market mechanisms created by this legislation have been proven to work as intended. The recent escalation of RIN prices is driven by the RFS obligations, and is precisely what is needed to incentivize growth in the share of renewable components in the fuel mix.

- E85 and Flexible Fuel Vehicles represent a readily available solution to enable the immediate blending targets of the RFS to be delivered, and should be considered a core part of any compliance strategy for meeting the RFS obligations. A clear signal to this effect from government, and maintenance of incentives for the Auto industry to maintain production of material numbers of flexible fuel vehicles, are necessary to ensure that the refuelling and vehicle infrastructure required are available to support this opportunity.

- RVO obligations beyond the level that can be achieved through E10 alone are essential to create the incentives within the value chain for renewable fuels to increase, and to create the growth envisaged by government policy.

- As such, relaxation of blend targets to levels below the so-called blend wall would immediately cause RIN prices to collapse, halt the growth in E85, and severely damage prospects of advantaged biofuel molecules (such as biobutanol) breaking into to the fuels market.

- When considering whether to diminish the aspirational objectives of the Renewable Fuels Standard, Congress and the Administration are faced with a clear choice. On the one hand, whether, to continue pursuit of energy security, reduced energy costs, rural job creation and lower greenhouse gas emissions, benefitting from new world beating technology developed in response to government leadership or, on the other hand, to forego this opportunity in favour of the status quo.

IMPACT OF DRAFT EPA 2014 RVO PROPOSAL

A draft proposal outlining a methodology for setting RVO's for 2014 (and beyond) was recently produced by the EPA and leaked to public. The approach outlined is to define RVO's based on the volume of ethanol required to produce essentially all US gasoline as E10, plus a small amount of additional ethanol from current E85 sales. This approach is fundamentally at odds with the objectives of the RFS, which clearly anticipated moving very substantially beyond what is possible with E10 alone. It appears that the methodology is specifically designed to collapse RIN prices in the mistaken belief that RIN prices impact gasoline prices at the street. However, as explained above, the RIN price is essential to creating incentives in the fuel value chain to drive increased levels of renewable energy in the fuel mix, but does not affect overall fuel price to consumers. If the leaked approach is implemented, the following impact can be expected:

- Conventional RIN prices will collapse to near zero, in line with historical trends.
- The reduction in RIN prices will force wholesale marketers to increase E85 prices significantly, and sales will drop to token levels. Any investment in increase E85 distribution and marketing can be expected to cease.
- Blending economics for drop-in biofuels will deteriorate substantially, since drop-in biofuels require higher RIN prices in order to remunerate the difference in production cost per gallon of higher energy content biofuels.
- Ethanol blending will revert to being driven by the economic incentive. The vast majority of gasoline will be blended with corn ethanol at 10% volume, which is readily available and for which there is a clear blend incentive.
- The gasoline price for consumers will increase over time, since the failure to implement the RFS as intended would underpin global crude oil demand and price.

RECOMMENDATIONS

Butamax is a joint venture of BP and DuPont which was established in 2009 to commercialize the biobutanol technology which they had been jointly developing since 2003. The goal of this privately funded effort, initiated prior to enactment of RFS, was to find a way to grow the benefits of biofuels while addressing many of the limitations of ethanol. The outcome is a fuel which is available to the transportation market and is not dependent upon on either government subsidy or government purchase of the product. Commercialization of a new fuel technology is necessarily time consuming as both gasoline and ethanol manufacturing processes are highly efficient, the markets in which they operate are very cost-sensitive and safety must be assured.

Specific Recommendations --

- **Maintain the existing mechanisms around RFS RINs** – The existing structure provides obligated parties with incentive to move forward towards achieving the goals of the RFS, while consumer choice creates the dynamic required to bring forward the most cost-effective solutions. While the issue of RIN fraud must, and is being addressed, the existence of RINs is vital to fuel our Nation's drive to support biofuel growth.

- **Retain clarity about the ultimate direction and scale –** While the RFS volume schedule will likely require adjustment due to the pace of commercialization of cellulosic biofuels, the demand side of the market requires long-term certainty to assure that necessary evolution of retail offerings, vehicle fleet and consumer behavior will occur as needed to achieve the policy objectives of the RFS. (It is important to note that the EPA has the authority to adjust the aspects of the advanced volume schedule to reflect the challenges of commercialising new technologies.)

- **Retain the technology neutral elements of RFS –** The RFS was specifically designed to be technology neutral. Drop-in fuels, such as biobutanol, offer the potential to greatly lower the cost of deploying a growing volume of biofuels. Loss of technical-neutrality risks these benefits.

APPENDIX – PARTICIPANTS IN THE FUEL VALUE CHAIN

Refiner –The vast majority of "gasoline" produced by US refiners today is actually not a finished gasoline product suitable for use in motor vehicles but instead is a blendstock designed to be blended with ethanol (90% gasoline, 10% ethanol) to produce E10. Different refiners have differing levels of downstream integration. Merchant refiners (i.e. Valero, PBF, HollyFrontier) typically sell large volume lots of their product at the refinery fence. Many refiners also participate in wholesale marketing (for example Exxon, BP and Shell); they blend E10 and sell it in truckload quantities out of distribution terminals to distributors or "jobbers". Only a small portion of refiners (e.g., Marathon, Northern Tier) directly supply or own retail gas stations.

- Refiners need to acquire RINs in proportion to their gasoline and diesel production in order to satisfy their RFS obligations.
- A large majority of these RINs are acquired at no cost through their integrated wholesale marketing businesses.
- When the refiner's obligations are less than the RINs they acquire through their wholesale marketing business, they are able to bank the excess RINs or sell them to others. When their obligations are greater than the RINs they acquire through their wholesale marketing activities, they can draw from any banked RINs (to a maximum of 20% of their obligation in a given year) or seek to purchase RINs from other parties.
- When the obligations of the refining industry, as a total, exceed the number of RINs which can be generated through E10 blending, market prices will increase RIN prices until they reach the level needed to incentivize blenders to produce E85 and sell it at prices which make it attractive to retailers and consumers.
- The US had recently become a net exporter of refined products and incremental exports above current levels can further reduce refiners' RFS obligations. However, attractive export markets are finite and US market demand is relatively inelastic. Accordingly, market forces can be expected to incentivize the US market to be fully supplied with various parties in the fuels market blending incremental E85 or other biofuel blends to generate the required RINs.

Ethanol Producer – An ethanol producer creates a RIN for every gallon of ethanol that they produce. This RIN is "attached" to the physical gallon of ethanol and may only be detached when that gallon of ethanol is blended into a finished fuel product for sale to an end-user in the US market. This program is managed by the EPA. Thus, the quoted wholesale price of ethanol is actually a combined price for the physical commodity and the attached RIN. Much of the ethanol used for gasoline blending in the US market is sold directly to refiners for use in their integrated wholesale blending

and marketing businesses. Some ethanol is blended into E85 directly by ethanol producers – in such cases, the ethanol producer is able to detach the RINs and sell them separately to other parties.

Ethanol producers have no obligation to produce under the RFS but refiners do have an obligation to use their product; this structure effectively assures that ethanol producers are able to recover their variable costs in the product price. RIN values effectively increase directly with ethanol price, largely shielding consumers from volatility in ethanol prices.

The potential price setting ability of ethanol producers is constrained by additional structural factors inherent in the industry and created by the RFS. Recall that the ethanol market, under RFS, effectively consists of three independent sets of producers – corn (conventional) ethanol, sugarcane (advanced) ethanol and cellulosic ethanol. While these three types of ethanol differ in the feedstocks employed and the greenhouse gas performance of their production technologies, they are producing the same ethanol molecule which must be treated the same way when blending gasoline. Further, the structure of RFS permits the refiner to use sugarcane ethanol in place of corn ethanol and cellulosic ethanol in place of both sugarcane or corn ethanal.

CORN ETHANOL – producers in this market are relatively fragmented, this industry has generally had excess capacity and there is an upper limit on the amount of corn ethanol which can be used annually for RFS compliance; this structure has generally limited the prices corn ethanol producers have been able to realize. Competition from sugarcane and cellulosic ethanol may, in the future, also serve to limit prices.

SUGARCANE ETHANOL – producers in this market are also relatively fragmented, but demand in the domestic Brazilian market and other parts of the world have generally served to limit supply to the US market. Planned production growth in Brazil, however, may make additional supply available to the US feasible in the coming years. Delivered cost to the US places an upper limit on corn ethanol prices; biodiesel and, in the future, competition from cellulosic ethanol can be expected to create a price ceiling on sugarcane ethanol. The market value of an advanced RIN can be expected to reflect the incremental cost of sugarcane ethanol over corn ethanol in the US market.

CELLULOSIC ETHANOL –Growth of the RFS significantly beyond current volumes is largely dependent upon the rate at which cellulosic production becomes available. While the first wave of cellulosic production may be more costly than existing technologies, it is expected that lower feedstock costs will ultimately overcome higher capital and operational costs to make cellulosic ethanol cost competitive with corn and sugarcane. So long as cellulosic ethanol production is projected to fall short of the statutory targets of the RFS

program, EPA is obligated to offer cellulosic waiver credits at a formula price. As refiners have the option of meeting their cellulosic obligation with either a cellulosic RIN or the combination of an advanced RIN and a cellulosic waiver credit, this sets an upper limit on cellulosic ethanol prices at the delivered cost of sugarcane ethanol plus the cost of a cellulosic waiver credit (42 cents/gal in 2013).

Wholesale Marketer – A wholesale marketer manages the combination of gasoline blendstock with ethanol to produce a finished product, such as E10 or E85 and sells those blended products to distributors (jobbers) or retailers. The blending activity generally occurs at a petroleum distribution terminal which receives and stores bulk shipments of gasoline blendstock (usually via pipeline or barge) and ethanol (usually via truck or rail). The terminal may be owned by a refiner, a wholesale marketer or an independent distribution company. In some markets, the blending is commonly done by or for jobbers. In some states, refiners are legally required to make unblended gasoline blendstock available to jobbers to do their own blending.

- Ownership of RINs detached as a result of the blending activity typically goes to the party who hired the blender. If this is not an obligated party (refiner) they will typically seek to sell the RINs in the market.
- Most terminals service more than one refiner with fungible gasoline blendstocks commingled in shared tankage and each refiner supplying their own ethanol to a community ethanol tank.
- The wholesale marketer chooses which blends to offer, typically based on input from their customers. Each marketer utilizing a shared terminal sets their own product prices.

In a market where fuel demand is declining and which is short on RINs, wholesale marketers can create value for refiners by finding a market for their fuel and supplying them with their RIN requirements. This requires that they offer successful retailers the right product blends at prices which will enable them to be competitive. The market value of the RINs generated will be set at a level which bridges from the costs of hydrocarbon gasoline and ethanol to the relative market value of E10 and E85 with a small incentive left for the wholesale marketer. The wholesale marketer's share of the RIN value will be capped by the ability of ethanol producers and jobbers to do their own blending and compete with the wholesale marketers for sales of RINs back to the refiners.

Retailer – Many retailers in the US today operate independently of refiners. While a large share of gas stations carry a refiner brand, these are generally franchisees (they agree for a period of years to exclusively source their fuel from the refiner, offer the refiner's standard set of fuel products to the refiners

quality specifications and configure the look of their site to the refiner's image standards; they do this in exchange for the refiner's marketing support and supply terms). While refiner brands retain a large share of the retail gasoline business, an increasing share is from big box retailers (Costco, Wal-Mart), grocers (Safeway, Kroger) and independent retail companies (Wawa, QuikTrip).

- Declining fuel demand and growing diversity of retailers makes retail gasoline pricing highly competitive. Fuel margins are often very small and store operations represent a major share of revenues.
- Independent companies (e.g., Propel) are entering the business of offering standalone biofuel product dispensing on existing retail sites.
- While retailers set their own product pricing and, increasingly, select their product offerings they ultimately need to price at levels which drive consumers who have multiple choices to buy. For E85 and other new biofuel blends this feeds back into the prices wholesalers must offer in order to drive volume and generate the RINs which are needed by refiners to meet their RFS obligations.

With stagnant vehicle miles travelled (VMT) and steadily increasing fuel economy, E85 has the opportunity to be a growing retail fuel product in an otherwise declining market. Retailers offering E85 will be able to maintain or grow their fuel volumes and have the best prospect for sustaining the store sales generated by fuel traffic. With retail fuel volumes declining and the mix of fuel retailers shifting away from refinery-branded dominance, successful retailers are well-placed to negotiate the best terms for supply of the range of fuels consumers are demanding; this may include being able to negotiate assistance in the installation of E85 dispensing equipment.

Consumer -- With U.S. gasoline demand steadily declining, existing market participants compete vigorously to retain volume. Retail gas sales in the U.S. are very much driven by price over all other considerations. (Branding of gas in the US does not impact consumer choice as much as it does in other countries.) Compared to non FFV users – who will still continue to enjoy price dictated by competition, consumers with FFVs will be able to make even more strategic choices where to buy their gasoline and at what price.

Consumers, particularly those who own FFV's, are the key to making the RFS succeed. They need to be incentivized to purchase E85 regularly. That incentive needs to be sufficient not only to impact current fuel purchases but also to incentivize demand for new FFV's by a growing percentage of new car buyers As E85 becomes increasingly available at attractive prices, informed consumers with FFV's can be expected to choose this product.

Senator BOXER. Thank you so very much.

Let me turn to Mr. Charles Drevna, President, American Fuel and Petrochemical Manufacturers. Welcome, sir.

STATEMENT OF CHARLES T. DREVNA, PRESIDENT, AMERICAN FUEL AND PETROCHEMICAL MANUFACTURERS

Mr. DREVNA. Chairman Boxer, thank you. Ranking Member Vitter and members of the Committee, I am pleased to be here.

In 2007, Congress enacted energy legislation which in essence promised significant steps toward energy independence, national security and added environmental protections. A major component of that law known as the RFS calls for massive amounts of renewables to be blended into the Nation's transportation fuel supply.

In 2013, we now know that the RFS Program was based upon erroneous market assumptions, obstacles that prevent the safe consumption of ethanol at increasing mandated levels and many other unintended negative consequences.

These critical flaws in combination with the resurgence of domestic energy production have led us to one unquestionable conclusion. It is not abundantly clear that the RFS has systemic problems that Congress must address immediately and decisively to avoid severe economic harm to individual consumers and to the Nation's economy.

Madam Chair, you asked the previous panel whether or not Congress should use every year to increase the, or set the volumes, for renewables. I submit that you already did in 2007. Those volumes are set statutorily.

Senator BOXER. You misunderstood me, but we will get into that later.

Mr. DREVNA. Ironically in a free market consumer choice and economics would drive the safe and efficient introduction of biofuels. As Mr. Collins just stated, they are inputting a lot of money into the free market, I would say, not some preconceived false market. DuPont is a pretty big company. They have some smart people. I understand, I understand the idea of the free market and I applaud them for doing it.

However, mandates are not the free market, and the reality is that the RFS will raise prices for virtually all consumer goods, possibly leading to a consumer backlash against renewables generally, not just the mandates. We believe this is not the result that Congress wants to achieve. In short, we should repeal this act.

We talked about the blend wall. We understand that we cannot go to blend wall. Another question was asked of the previous panel. Will the refining industry continue to use ethanol? Yes, we are geared to use it at 10 percent. The problem is going over 10 percent whether it is from technologies that exist today, like corn ethanol, or cellulosic ethanol. It is still ethanol. The automobile engine or the lawnmower engine, it makes no differentiation between the two.

Complicating matters further, we are not the entities that in many cases actually blend the ethanol and we must go into the open market to purchase the compliance credit known as the RIN. When this fuel supply contains the maximum number of renewable fuel that it can handle, no more RINs can be generated for pro-

ducers for compliance. So, in essence, the RIN is a permit to sell gasoline and diesel. It is the mirror image of the cap and trade system.

And Senator Vitter, this goes to your question regarding the impact on consumers ultimately at the pump. Refiners are going to have a couple of choices if this RIN market continues at it was in the winter and summer of 2013 here. If you cannot get the RIN credit to sell the gasoline or diesel, you can either cut runs or you can export more. Either way, as studies have indicated, either way is not good for the American consumer.

The volumes that EPA proposed in August to waive the 2014 requirements is a good start, but we believe you need an additional cushion. We believe you are trying to be too, too accurate on setting that number. We think a 9.7 percent would be better to allow some liquidity in the market.

In closing, I have got 5 seconds here, folks, this is an unworkable law. It is a negative impact on the consumer. We understand the desire of Congress in 2007, but let us look at it from a 2013 reality.

Thank you.

[The prepared statement of Mr. Drevna follows:]

WRITTEN STATEMENT OF

AMERICAN FUEL & PETROCHEMICAL MANUFACTURERS

AS SUBMITTED TO THE

COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS

United States Senate

on

"Oversight Hearing on Domestic Renewable Fuels"

December 11, 2013

AFPM, the American Fuel & Petrochemical Manufacturers, appreciates the opportunity to share its views on the Renewable Fuel Standard (RFS). AFPM is a trade association representing high-tech American manufacturers of virtually the entire U.S. supply of gasoline, diesel, jet fuel, other fuels and home heating oil, as well as the petrochemicals used as building blocks for thousands of products vital to everyday life. AFPM members operate 122 U.S. refineries comprising approximately 98 percent of U.S. refining capacity. As refiners and importers of gasoline and diesel, AFPM's members are the obligated parties under the RFS.

This hearing comes at a critical time for the refining industry and American consumers. The energy landscape in the United States is markedly different than it was during the debate over creating the RFS, as the U.S. is experiencing a crude oil and natural gas production revolution that is redefining energy security as we know it. It is also now clear that the RFS is not only failing to achieve many of its original purposes, but in many cases undermines its own goals. This testimony will provide some context around the changed circumstances around key justifications for the original law, the issues obligated parties face if the law is implemented as written, a brief discussion on the importance of EPA's action to reduce the 2014 volumes, and why Congressional action is still vitally important.

I. Background

The RFS was established with the goals of enhancing both energy security and environmental protection, while providing development opportunities to rural America. Many also believed advanced biofuels would be developed that could work in existing infrastructure and be produced from non-food feed stocks. In practice, however, the RFS has operated contrary to these goals and most of its foundational assumptions turned out to be false. Refiners are now forced to comply with an unworkable law that places consumers at risk of high food and fuel costs, engine damage, and environmental harm.

This hearing takes place against a backdrop of greatly increased domestic oil and gas production that promises to enhance energy security for the U.S., without mandates or subsidies. Meanwhile, second generation renewable fuels have not materialized as the reality becomes clear that policymakers cannot mandate innovation or favorable economics. Perhaps most critically this year, fuel demand, which was projected to steadily increase when RFS2 was established in 2007, has declined and is expected to decline further. The annually increasing amounts of biofuel required to be blended into a declining fuel supply mean the federal biofuel mandate threatens to create fuel supply shortfalls and risk damaging consumer engines. The combination of these factors demonstrates that the RFS is unnecessary, unworkable, and should be repealed.

A. Changes since RFS2 was adopted

Energy security landscape. In 2007 the energy discussion in the United States was one of scarcity, not abundance. Since that time, the U.S. began to unlock its true energy potential – without the use of mandates or subsidies. The Energy Information Administration reported in November 2013 that for the first time in nearly 20 years the U.S. produced more oil than it imported. In July, the Energy Information Administration (EIA) testified before the Senate Energy and Natural Resources Committee that between 2007 and 2012, domestic oil production increased by 1.5 million barrels per day, or 30 percent, with most of the growth occurring over the past three years.[1] Onshore oil production in the lower 48 states rose 64 percent between February 2010 and February 2013 alone.[2] The United States' newfound energy abundance is not a short-term phenomenon. Indeed, comparing its 2007 and 2012 estimates for 2022, EIA projects a 23-percent increase in oil production and a 62-percent increase in natural gas production. During that time, U.S. petroleum imports declined from 61 percent of consumption to 41 percent in 2012. EIA testified before the House Energy and Commerce Committee on June 26 that ethanol was only a minor factor in the drop in petroleum imports.

[1] Testimony of EIA Administrator Adam Sieminski before the Senate Committee on Energy and Natural Resources (July 16, 2013).
[2] *Id.*

Ironically, and as detailed below, by placing refining infrastructure at risk, the RFS will also undermine this important American economic and security advantage.

Failure of cellulosic and other advanced biofuels leads to increased imports. At the same time that the U.S. has been increasing oil and gas production, development of many advanced biofuels promised at the time the RFS was enacted has not occurred. Given this reality, the RFS essentially mandates fuels that do not exist. The law requires specific advanced biofuels to be blended into the fuel supply, including biomass-based diesel, cellulosic biofuels, and other advanced biofuels. When the RFS was written into law, policy makers envisioned one billion gallons of cellulosic biofuel would be consumed in 2013, increasing to 16 billion gallons by 2022. In reality, zero gallons of cellulosic biofuel were produced in 2010 and 2011, and only 21,093 gallons were produced in 2012 (20,069 of which were exported and unavailable for compliance). EPA's EMTS data indicate less than 360 thousand gallons of cellulosic fuel have been produced January through October 2013. In addition, EIA projects that drop-in biofuels[3] will only grow to approximately 341 million gallons by 2022—enough to satisfy .07 percent of gasoline demand.[4]

Ironically, for a law with "energy independence" in its title, EPA indicated in the NPRM that in 2013, most of the other unidentified advanced biofuels (i.e., excluding biomass-based diesel and cellulosic) mandated would be met by imported sugarcane ethanol (primarily from Brazil). The prevalence of imports and failure of the RFS to develop domestic second and third generation biofuels ensures that RFS will continue to rely on imported ethanol to satisfy its advanced biofuel volumes. This situation belies the argument that the law is enhancing energy independence and, as explained later, ensures the required use of biofuels generating more emissions and other environmental issues than arise from using gasoline.

Fuel Demand. While the energy supply picture has been changing, so has fuel demand. Largely due to the stagnant economy, and improved automobile efficiency, projections for gasoline[5] use have shifted significantly between 2007 and 2012. The 2007 EIA Annual Energy Outlook projected a 12 percent higher demand for gasoline in 2013 than is actually occurring. The 2013 Annual Energy Outlook (AEO) now projects 2022 gasoline demand will be 28 percent lower than the 2007 AEO projection for 2022. Importantly, and as described below, the combination of decreased gasoline demand and rising biofuels mandates has exacerbated the onset of the E10 blendwall—the point after which blenders are unable to safely add additional ethanol to the fuel mix. We are now at the point where existing delivery infrastructure and the consumer vehicle fleet are not capable of safely handling increased concentrations of ethanol.

B. Flawed implementation concept

The RFS is implemented in a way that makes fuel manufacturers responsible for consumer's renewable fuel demand. The mandate establishes how much biofuel volume must be consumed, but quixotically places the obligation for such consumption on upstream fuel manufacturers, who do not have the ability to control the nation's downstream ethanol blending or retail operations. Refiners and importers must demonstrate that for every gallon of gasoline and diesel fuel they sell into the U.S. market, a certain amount of renewable fuel was consumed. This requirement holds despite the fact that refiners have no control over either consumer purchasing habits or (in the majority of cases) retail decisions on what fuels to sell to the public or whether to replace dispensers and other refueling infrastructure to accommodate corrosive ethanol blends. Additionally, the structure of the mandate allows compliance credits, called Renewable Identification Numbers (RINs), to be held by non-obligated parties, boosting compliance costs for obligated parties because these intermediate, nonobligated parties see an opportunity to profit from participation.

---

[3] Drop-in biofuels can move in pipelines, trucks, and barges without equipment modification; are usable in existing fueling stations without modification, and are usable by existing vehicle fleet without modification.
[4] EIA, *Drop-In Biofuels in the AEO*, EIA Biofuels Workshop, March 20, 2013.
[5] Gasoline includes blends of up to 10 percent ethanol.

Penetration of new fuels requires that consumers see a benefit to buying the fuel and that retailers see adequate market incentives to install equipment or make other changes necessary to offer the fuel. A common misconception is that refiners or importers own/control retail operations. Refiners own less than five percent of the retail stations in the U.S. In June 2011, GAO reported that the major integrated companies own only one percent of the stations and only half of stations are "branded" franchises. The remaining retailers are unbranded independent businesses, and 56 percent of all stations are single-station operators. In the case of franchised gasoline stations, station owners are responsible for the equipment and infrastructure—the branding is often just a fuel supply agreement whereby the franchisee has certainty in its supply rather than relying on the spot market.

These stations may sell higher ethanol blends (such as E85 or E15) as long as they continue to sell the branded product (a key feature of a franchise), but they generally have chosen not to carry these higher ethanol blends because of a lack of consumer demand and the potential liabilities associated with mid-level ethanol blends. In general, franchisees get the benefit of a steady fuel supply at a contracted price, marketing assistance, and the ability to use a refiner's trusted brand to help sell fuel. Typically, in return, franchisees must sell at least two grades of the refiner's product. Put another way, franchisees are getting the benefit of a contractual bargain between two private parties – the definition of a free market. Those franchisees may invest in additional tanks and dispensers to carry additional fuel types, or may terminate their franchise agreements and sell unbranded fuel.

Retailers must therefore see the financial benefit in offering a new fuel, including an increase in demand for the new fuel that requires consumer acceptance. Penetration is not quick in many areas, even in cases where much of the infrastructure was in place. One alternative fuel currently available in certain markets is E85, which contains up to 85 percent ethanol and 15 percent gasoline. E85 requires specialized storage and dispensing equipment and can only be used in flex fuel vehicles (FFVs), which consist of less than five percent of the total consumer vehicle fleet. The infrastructure and vehicles are not in place for the widespread adoption of E85, and acceptance of this fuel has moved much more slowly than E10, with sales in key states that promote E85 actually declining last year before rebounding to the historic mean in 2013. These realities place a functional cap on the amount of ethanol that can be blended into the fuel supply at E10 and creates significant barriers to implementing the RFS, which will be discussed later in more detail.

In addition to the market acceptance and penetration issues, a perverse compliance mechanism exacerbates the adverse implications of the RFS. Obligated parties (refiners and importers) must obtain a requisite number of RINs to turn into EPA to demonstrate compliance each year. A RIN is generated when a gallon of renewable fuel is produced. It stays with this gallon until it can be separated when an obligated party purchases the gallon of biofuel or when that gallon is blended into the fuel supply. Refiners do not often own the terminals where the biofuel is blended, or do not own enough terminal capacity to satisfy their full obligation in any given year, and must therefore rely upon unrelated third parties to blend ethanol and make the separated RINs available to the marketplace. Many refiners and importers simply sell gasoline blendstocks into the wholesale market, where a third party terminal or marketing company purchases them and blends in ethanol to produce finished fuel. Unless an obligated party owns the terminals or other marketing assets that can cover its full obligation, or has a contractual agreement with the owner of those assets, the obligated party must buy RINs from marketers or off the open market. As a result, a company purchasing its RINs on the open market at $1.00 each incurs an implied $0.10 per gallon increase in cost to produce a gallon of gasoline. To further illustrate why RINs are not "free," as some claim, one need look no further than the first quarter financial statements of many terminal companies. Although they are not obligated parties, these companies and others like them actually blend the fuel and sell RINs to the obligated parties for compliance. These companies reported significant new revenue from RIN trading during the run-up in prices through the first half of 2013. To be clear, AFPM does not believe these companies are unduly benefiting or doing anything wrong – this is just illustrative of how the RFS works and more evidence of its true cost.

After understanding changing market dynamics since the inception of the RFS and the intricacies of its implementation, it is important to focus on the serious short-term problem of the blendwall and

highlight the long-term issues of the RFS. However, AFPM would like to reiterate that it is neither anti-biofuels nor anti-ethanol. Two of AFPM's members are among the top five ethanol producers, and at least one makes more ethanol than 97 percent of the Renewable Fuels Association's membership. Biofuels can and do play an important role in the fuel mix, provided they are safely integrated into the fuel supply and consumers demand them. In testimony before the House Energy and Commerce Committee on June 26, 2013, both EIA and the U.S. Department of Agriculture (USDA) indicated that as long as ethanol is economical to use, refiners and blenders would likely continue to use it – even in the absence of a mandate. However, AFPM opposes mandates and subsidies, including the RFS, because they limit consumer choices and stifle innovation. Moreover, and as this testimony demonstrates, the law is unworkable at its core, threatening to significantly raise consumer costs. For these reasons, Congress should repeal the RFS.

II. Serious Short-Term Issue: the Blendwall

The U.S. currently faces the onset of the E10 "blendwall," which will fundamentally compromise the fuel industry's ability to simultaneously meet the requirements of the RFS and to meet U.S. transportation fuel demand. The E10 blendwall refers to the point where nearly all the gasoline supplied domestically contains 10 percent ethanol, which is the effective, practical limit on the amount of ethanol that can safely be blended into the fuel supply without risking engine or infrastructure damage.

A. RFS volumes create blendwall challenges in 2013 and 2014

As referenced above, gasoline demand is falling in the United States. EIA's current projection of gasoline demand for 2013 is 133.8 billion gallons, and is expected to fall an additional 600 million gallons to133.2 billion gallons in 2014.[6] At these levels of demand, the 10 percent (E10) saturation point is approximately 13.3 billion gallons. This year, the RFS requires obligated parties to obtain and submit 13.8 billion conventional biofuel renewable identification numbers (RINs) to demonstrate that the requisite gallons of renewable fuel were blended into the fuel supply. The conventional biofuel mandate is primarily filled by corn-based ethanol. In addition to conventional biofuels, the RFS requires volumes of cellulosic biofuel, other advanced biofuel (included sugar-cane-based ethanol), and biomass-based biodiesel. These RFS volumes are "nested" mandates as depicted in figure 1. When you add the requirements for each of these biofuel types together, EPA finalized a renewable fuel obligation totaling 16.55 billion gallons in 2013 (approximately 14.6 billion gallons, or 88 percent, of which is projected to be ethanol from both conventional and advanced fuel mandated categories). Therefore, the proposed EPA RFS obligation for 2013 is already requiring much more ethanol than E10 and the mandate now exceeds the amount of ethanol our fuel delivery system can safely handle. As a result, obligated parties will only use approximately 13 billion gallons of conventional ethanol in 2013, and fill the remaining obligation with banked RINs from previous years. In 2014, as obligated parties exhaust the supply of banked credits (RINs) from over-complying in previous years[7], and as gasoline demand declines further while facing a statutory implicit conventional ethanol mandate of alone 14.4 billion gallons, the math becomes even more problematic.

[6] EIA Short Term Energy Outlook (November 13, 2013).

[7] Obligated parties have can comply by meeting up to 20% of its current obligation with RINs generated in the previous year. In previous years, blenders used more ethanol than mandated, creating a "RIN bank" that will likely be drawn down by 2014 as obligated parties use these banked RINs for 2013 compliance.

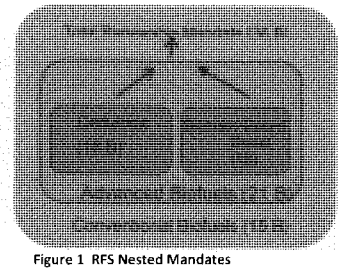


Figure 1 RFS Nested Mandates

B. Market already showing blendwall effects through RIN prices

Although not every company or every region reaches the blendwall at the same time, due to differences in companies' business models, the market indicated that the combination of higher mandates and declining gasoline consumption forced the onset of the blendwall in 2013 and that the full effects will start to be felt in 2014. This is most apparent in the RIN market, which reflects the expectation of how much ethanol can be blended into gasoline. This RIN supply/demand tightening is not due to ethanol production shortages, but to the inability to push more ethanol into the fuel supply and generate more RINs. As the mandates increase, the demand for RINs increases, but the RIN supply is tighter because the mandate is higher, meaning fewer companies have excess RINs to sell. Prior to the onset of the blendwall, conventional biofuel RINs (D6 category) typically traded at $0.02-0.04 until late 2012. Since that time, however, D6 RIN prices increased to as much of $1.48 the week of July 15 as the market anticipates a RIN shortage (see figure 2). At $1.48 per RIN, an obligated party selling to the wholesale or spot market, without controlling the blending facility or retail, faces an added $0.148 per gallon to produce gasoline. After a series of House whitepapers and hearings, and EPA's proposal to waive the 2014 volumes due to the blendwall, RIN prices retreated to the $0.18-$0.25 range. While significantly less onerous that $1.40 RINs, current RIN prices are more than 500% higher than historical trends and remain volatile. RIN price volatility will continue due to uncertainty in EPA's rulemaking process—only Congressional action can reduce this volatility in the long term.

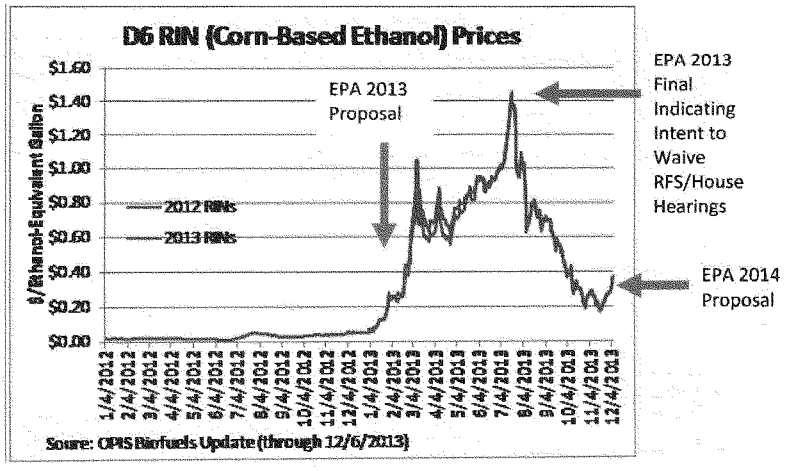


Figure 2 Corn Ethanol RIN Prices (Source: OPIS)(used with permission)

Finally, the RFS requires companies to buy RINs for biofuel that may need to be blended into products they do not even make. For instance, if the year's renewable fuel obligation is 10 percent, a company that produces 100,000 gallons of gasoline and diesel would incur an obligation to produce 10,000 RINs divided among the nested RFS categories – regardless of their ratio of fuels produced. Thus, a company that produces very little diesel still incurs an obligation to purchase biomass-based diesel RINs.

This leads to the question of what options are available to obligated parties. Obligated parties have limited options to remain in compliance with the requirements of the RFS as the blendwall hits. First, obligated parties will maximize the amount of E10 sold and for a short period of time, some may be able to rely on the limited number of banked RINs generated from over compliance in previous years. EIA reported in June that the small amount of RINs that are allowed to be carried over from last year, which exist from companies that may have over-complied with the mandate last year, are expected to fall significantly in 2014.[8] While some claim E15 and E85 provide answers to this problem, as described below, incompatible infrastructure, vehicles and consumer demand place insurmountable restraints on the ability of these fuels to meet challenges of the blendwall – and particularly the short-term challenges obligated parties face.

C. E85 will not solve the blendwall

E85[9] will not (and cannot) generate sufficient RINs to alleviate the effects of the blendwall—particularly in the short term. Due to limited infrastructure, the limited number of flex-fuel vehicles (FFVs) in commerce, and lack of interest in the fuel from FFV owners with access to the fuel, E85 will not solve the blendwall problem. In particular, the Department of Energy estimates that approximately 2,347 retail stations (less than 1.5 percent of stations nationwide) carry E85.[10] There are only approximately 11.5 million FFVs in use today (equal to about 5.1 percent of the overall light duty vehicle fleet There are only approximately 11.5 million FFVs in use today (equal to about 5.1 percent of the overall light duty vehicle fleet). In its 2010 Regulatory Impact Analysis, EPA estimated a very low refueling rate (only 4% in 2008) for FFVs with reasonable access to E85.[11] AFPM is not aware of more recent numbers, but sales data continues to show stagnant E85 sales, notwithstanding an increase in the number of FFVs on the road.

According to EIA, based on observations of Brazil's experience, consumers buy fuels based on energy adjusted price. A gallon of gasoline has more energy than a gallon of ethanol. In fact, the average E85 blend has 76-percent of the energy content of gasoline, meaning E85 consumers lose 24-percent of the fuel mileage.[12] E85 has not been price competitive with regular gasoline at any point since the inception of the RFS, a major reason for stagnant consumer interest. For example, the AAA Fuel Gauge Report, which displays energy-adjusted prices for E85 and other fuels, regularly shows that E85 is more expense than regular gasoline.[13] Even with the price incentives use more E85 in 2013, data for two heartland states using E85 (Minnesota and Iowa) indicate that sales recovered from the depressed levels seen in 2012, but only to prior historical levels.[14] Although E85 sales have recovered from 2012 lows, even with the high RIN prices in 2013 the state did not experience record sales.

---

[8] http://www.eia.gov/todayinenergy/detail.cfm?id=11551.
[9] E85 contains 51-83 percent ethanol.
[10] EIA Biofuels Issues and Trends at 29 (Oct. 2012), citing http://www.afdc.energy.gov/fuels/ethanol_locations.html.
[11] 75 FR 14762
[12] EIA, *Biofuels Issues and Trends*, at 29 (Oct. 2012).
[13] AAA Fuel Gauge Report available at http://fuelgaugereport.aaa.com/?redirectto=http://fuelgaugereport.opisnet.com/index.asp
[14] http://mn.gov/commerce/energy/images/E-85-Fuel-Use-Data.pdf.

As mentioned in the previous section, the overwhelming majority of gas stations are owned and operated by small businesses, not by obligated parties. Installing a pump can cost up to $200,000 per station – depending on how extensive an overhaul is required. In order for a small business to make such an investment, it needs certainty that the product will sell – certainty that does not exist in the case of E85. In June, a National Association of Convenience Stores (NACS) survey found that 75 percent of retailers do not believe there is sufficient demand for E85 to justify the expense associated with installing an E85 pump.

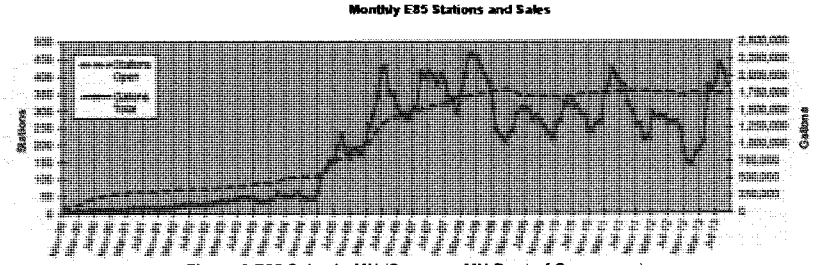


Figure 3 E85 Sales in MN (Sources: MN Dept of Commerce)

The future is not much brighter for E85. The 2011 CAFE standards began to phase out credits for FFV production, creating a disincentive for automakers to continue producing FFVs. Even assuming significant increases in the installation rate of flex-fuel pumps (which will still not help obligated parties alleviate the blendwall in 2013 and 2014), E85 is also unlikely to achieve widespread consumer acceptance in the long term. In its 2010 regulatory impact analysis, EPA estimated that to meet the volumes envision by the RFS, 70 percent of the nation would need access to E85 at one in every four pumps they pass, and FFV owners would need to fill up with E85 74 percent of the time in 2022 – a far cry from the market realities nationwide and the Minnesota experience.[15]

In the short term, EIA projects that E85 sales will reach only 100 million gallons in 2013 – barely moving the needle in the 133 billion gallon gasoline market. To meet the 2014 statutory volumes for conventional ethanol alone, consumer demand for E85 would need to increase more than 1900 percent. To meet overall 2014 volumes, consumer demand would need increase 3400 percent. Moreover, EIA lowered its long term projections for E85 sales between 2012 and 2013, and now projects that E85 demand will remain flat at approximately 0.5 percent of transportation fuel demand through 2040. For these reasons, E85 is not a viable solution to the ethanol blendwall.

D. E15 will not solve or delay the blendwall

In 2011, EPA approved a 50-percent increase in the amount of ethanol (from 10 percent to 15 percent, or E15) that may be used in model year 2001 and newer automobiles. However, E15 creates significant market and legal concerns among fuel manufacturers, distributors, and retailers, as well as small engine manufacturers and automakers. E15 provides a limited and problematic path to RFS compliance, but ultimately does not solve the blendwall even as it creates an entirely new set of problems for consumers.

Engine Compatibility. Critically, despite EPA's assertions that E15 is safe to use in model year 2001 and newer cars, no automaker will warranty E15 for those cars built before 2012. Although some automakers have recently begun certifying new cars for E15, there are still a significant number of legacy vehicles on the road that were not built or certified to use E15. The disconnect between EPA's assertion about E15's safety and the automakers concerns stems from the depth and breadth of

[15] EPA RFS 2 Regulatory Impact Analysis at 291.

testing that EPA and DOE undertook. In particular, in evaluating E15 for use in 2001 and newer vehicles, EPA only tested the emissions control devices (e.g. catalytic converters) of the automobiles, but overlooked other critical engine components, such as fuel pumps. Subsequent testing undertaken by the Coordinating Research Council (CRC) demonstrates the inadequacy of EPA's approval process. In two studies conducted on engine durability and fuel pumps, CRC found that a substantial number of the 29 million 2001-2007 light duty vehicles (LDVs) on the road today are susceptible to system failure and other mechanical damage from E15 – notwithstanding EPA's approval. It is important to note that EPA and DOE were both participants in the CRC testing. There are no other non-road or off-road engines (motorcycles, lawnmowers, boats, etc) approved to use E15. Historically, nonroad, heavy duty gasoline vehicles, and motorcycles consumed about 8 percent of gasoline in the U.S.[16] However, the haphazard way EPA has allowed for the introduction of E15 into the marketplace could lead to significant consumer misfueling of these non- or off-road engines. The fact that E15 is not backward compatible with existing gasoline engines creates a significant potential liability throughout the fuel supply chain and represents one of the most significant hurdles to the provision of E15 in the marketplace.

Infrastructure compatibility. The lack of engine compatibility is exacerbated by the lack of infrastructure compatibility. A 2010 study by the National Renewable Energy Laboratory (NREL) found that using E15 in fuel dispensers already approved for E10 resulted in reduced levels of safety and performance. Similarly, in a 2011 review of challenges with mid-level ethanol blends, the Government Accountability Office (GAO) identified several challenges with E15 retail[17]:

> First, federal and state regulations governing health and environmental concerns must be met before these blends are allowed into commerce, and fuel-testing requirements to meet these regulations may take 1 year or more to complete. Second, according to knowledgeable federal officials and UL representatives, federal safety standards do not allow ethanol blends over E10 to be dispensed at most retail fueling locations, and federally sponsored research has indicated potential problems with the compatibility of intermediate ethanol blends with existing dispensing equipment. Third, according to EPA and several industry representatives, the compatibility of many UST systems with these fuels is uncertain, and retailers will need to replace any components that are not compatible if they choose to store intermediate blends. Fourth, industry associations representing various groups, such as fuel retailers and refiners, are concerned that, in selling intermediate ethanol blends, fuel retailers may face significant costs and risks, such as upgrading or replacing equipment.

All equipment used to store and dispense flammable and combustible liquids must be certified by a nationally recognized laboratory, such as Underwriters Laboratories (UL). Significantly, UL will not retroactively certify existing infrastructure to handle E15 and has not approved significant numbers of pump configurations. Moreover, underground storage tanks (USTs) must likewise be certified for higher ethanol blends. EPA reports that because USTs have a lifespan approaching 30 years, many USTs in commerce are not able to handle E15. As a result, and much like E85, large investments must be made by small businesses in order to sell E15.

Misfueling and Consumer Awareness. A new fuel, like E15, introduced into commerce without sufficient misfueling mitigation measures will likely lead to misfueling and damage consumers' engines. Unfortunately for consumers, EPA's only misfueling mitigation requirement is a small 4x4 label calling "attention" to E15's appropriate uses, but does not include requirements for a physical

[16] EPA RFS2 Regulatory Impact Analysis at 288.
[17] Government Accountability Office, *Biofuels: Challenges to the Transportation, Sale, and Use of Intermediate Ethanol Blends*, June 2011, available at http://www.gao.gov/assets/320/319297.pdf.

barrier to misfueling like those that were present during the switchover from leaded to unleaded gasoline. Exacerbating the problem is a general lack of consumer awareness about E15. In December 2012, AAA conducted a survey and found that 95 percent of consumers had not even heard of E15. Based on the results of the survey and the fact that less than 5 percent of cars on the road are designed and built to handle E15, AAA recommended against E15's sale and use. In June 2013, NACS found that when consumers learned about E15, only 56 percent said they'd be willing to buy it if it were the same price as gasoline.

The combination of engine and retail compatibility issues, inadequate misfueling protection and a lack of consumer awareness creates a major disincentive for fuel manufacturers and retailers to sell E15. Nearly half of the retailers surveyed by NACS identified potential liability as a concern in selling E15.

Other issues. E15 does not qualify for the one-pound Reid Vapor Pressure (RVP) waiver legislated for E10. EPA regulates RVP, a measure of gasoline's volatility, to control hydrocarbon emissions, a ground-level ozone precursor. According to EIA, E15 would not be an environmentally compliant fuel in summer months using most current gasoline blendstocks. This is a simple, but major, disincentive for fuel manufacturers and blenders to produce E15. In some cases terminals would not be able to stock another distinct blendstock. DOE has also noted that 90 state laws and regulations limit the sale of E15 and it is not known when they will be revised. Other states, such as California, do not currently allow the sale of E15.

Finally, it is worth noting that if none of the market, technical or legal barriers existed, nationwide use of E15 would only permit approximately 19 billion gallons of ethanol in the fuel supply—15 billion gallons short of EPA's estimate of the ethanol needed to fulfill the full RFS, which is nearly equal to the entire cellulosic biofuel mandate. In terms of how it operates in engines and infrastructure, ethanol is ethanol regardless of feedstock. For those interested in second generation ethanol, however, these numbers should cast serious doubts about the RFS' ability to achieve those goals.

E. Biomass-based diesel will not solve the problem

Another pathway for generating additional RINs for RFS compliance is to use more biodiesel, which generates 1.5 RINs for each gallon used and which is not currently butting up against the biodiesel blendwall (commonly understood to be a maximum of five percent biodiesel that can be blended for use in existing diesel engines). Biodiesel comprises a little less than three percent of the diesel consumption, but the real challenge facing biodiesel is its feedstock supply. EIA projects that only 1.32 and 1.21 billion gallons of biodiesel will be produced in 2013 and 2014, respectively. A major impediment for biodiesel is cost, as biodiesel derived from soybean oil typically costs more than $1.00 more to produce than petroleum diesel. Finally, and as explored more fully in section III(D), in 2011 and 2012 the biodiesel industry faced serious instances of RIN fraud (a situation not yet resolved). EPA's treatment of obligated parties that purchased fraudulent RINs froze the biodiesel market and hurt the growth of the biodiesel industry.

A related, unanticipated, effect of the RFS is its treatment of diesel. Due to a combination of the RFS structure, a modest biomass-diesel supply, and the practical cap on biodiesel that can be blended into diesel fuel, for each gallon of diesel a refiner produces, it incurs a "diesel deficit" that requires additional ethanol RINs for compliance. Put another way, a refiner's obligation is determined by the total volume of gasoline and diesel produced or imported for domestic consumption. For each gallon of diesel fuel added to the fuel supply, an obligated party must produce RINs for each of the nested mandates. Because biodiesel can only make up a limited portion of the fuel supply (currently less than three percent), and petroleum diesel is only able to use biodiesel as an additive, there is a significant shortfall in RINs that must be filled by additional ethanol RINs. In 2013, each gallon of diesel produces a 6.63 percent RIN deficit. While in prior years, surplus conventional ethanol RINs were available to make up this difference, the blendwall and associated impact on RIN costs make the diesel deficit more costly and increasingly unworkable. In recent weeks, biodiesel and ethanol RINs have been trading at roughly the same price.

F. Other Options for Obligated Parties and Resultant Impacts

After understanding how E15, E85 or greater biodiesel use are not viable pathways for addressing the blendwall, it becomes apparent that refiners are left with few options for compliance. If obligated parties are unable to purchase RINs in the open market at an affordable price, the remaining RFS compliance options are reducing gasoline and diesel supplied to the U.S. through a combination of reduced refinery runs, reduced imports, and increased exports. For instance, a 10 percent RVO on a 100,000 gallon refinery means the company needs to turn in 10,000 RINs if the fuel is sold in the U.S. If that company cuts back production and exports so that its total domestic supply is only 70,000, the company reduced its obligation by 3,000 RINs to 7,000. Due to the respective blendwalls of ethanol and biodiesel, a refiner has incentive to cut back on diesel production first. This is most simply explained as follows: 100 gallons of diesel blended as B3 (i.e., 97% diesel and 3% biomass-based diesel) will generate 4.5 RINs (since a gallon of biomass based diesel is given 1.5 RINs). However, 100 gallons of E10 (90% petroleum blendstock and 10% ethanol) will produce 10 RINs. Adding to the diesel hurdle, production of biodiesel in 2013 is unlikely to meet five percent of the U.S. diesel fuel market, exacerbating the diesel deficit under the RFS. Therefore a company facing a RIN shortfall will reduce its obligation by cutting back first on diesel sold in the U.S. The RIN essentially now acts as a permit to sell gasoline and diesel to the U.S. market.

The macroeconomic implications of this situation are significant. Diesel is the primary fuel used to transport a wide variety of goods through truck and rail, as well as a major input into agricultural production. In 2011, for example, U.S. farms consumed approximately 2.9 billion gallons of diesel. NERA Consulting recently modeled the implications of the blendwall and found that by 2015 (assuming the statutory requirements are maintained) the blendwall will cause a $770 billion decline in GDP, a reduction of $2700 in household consumption, a 30 percent increase in the cost of producing gasoline, and a 300 percent increase in the cost of producing diesel.

While NERA's numbers are staggering, real world examples from this year already demonstrate the arrival and impact of the blendwall.

1. In March, the Oil Price Information Service (OPIS) reported that a Florida gasoline importer was turning a planned shipment to an offshore buyer in order to avoid incurring a RIN obligation.

2. Monroe Energy, which saved a Philadelphia area refinery in 2012, will spend substantially more on RINs this year than it purchased the refinery for last year.

3. PBF Energy, a large supplier to the east coast market, will increase its ethanol blending in 2013, but will still need to purchase approximately half of its RINs. PBF estimates its spent $108 million through the first three quarters of 2013.

4. Valero Energy testified before the Senate Energy and Natural Resources Committee that it expects to spend $500 million in increased costs due to RIN volatility in 2013. Valero is also the third largest ethanol producer in the United States, with 10 ethanol plants and over 1.2 billion gallons of annual production.

The blendwall is the most immediate and significant concern with the RFS, although it is not the only issue.

III. Long-term RFS issues beyond the blendwall

Two of the major objectives of the RFS were to move towards energy independence with increased domestic fuel supply and improve the environment through reduced greenhouse gas emissions. The RFS is doing little towards meeting these goals. We are meeting the energy independence through

the surprising increase in U.S. and Canadian production of crude oil and natural gas, not anticipated in 2007, the development of technologies for economic production of more environmentally friendly second generation fuels has not occurred, and the promised environmental benefits of conventional biofuels have been called into question. We must rethink the nation's energy policies in light of these new realities.

A. Environmental Impacts.

In light of biofuels' purported environmental benefits as a central rationale for the RFS, it is important to recognize the actual impacts biofuels are having on the environment. It is now clear that, using EPA data and peer-reviewed data from the National Academy of Sciences (NAS), the RFS is not only failing to achieve its promised environmental benefits, but that it is undermining progress compared to a gasoline-only baseline. In particular, EPA's own data shows that the overwhelming majority of ethanol produced this year will actually raise greenhouse gas (GHG) emissions compared to gasoline. For the typical natural gas fired dry mill plants[18], GHG emissions are increasing by 33 percent over gasoline.

Moreover, a comprehensive 2011 study by the NAS found that lifecycle emissions of major air pollutants (CO, NOx, PM2.5, SOx, and NH3) are higher for corn and cellulosic ethanol than for gasoline. NAS states, in part, "overall production and use of ethanol was projected to result in increases in pollutant concentration for ozone and particulate matter [compared to] gasoline on a national average, but the local effects could be variable. Those projected air-quality effects from ethanol fuel would be more damaging to human health than gasoline use." Similarly, EPA reports that biodiesel production and use is increasing levels of NOx, PM (10 and 2.5), SO2, and NH3 compared to petroleum diesel.

According to EPA's 2010 Regulatory Impact Analysis, RFS2 will raise ozone levels 0.46 ppb over the RFS1 baseline, placing dozens of counties in danger of falling into non-attainment. In addition to the air quality and GHG impacts, ethanol requires an enormous amount of water to produce. NAS estimates that a gallon of gasoline requires between 1.4-6.6 gallons of water to produce. By comparison, corn ethanol requires 15-2400 gallons and switchgrass cellulosic ethanol requires 2.9-1307 gallons. It is clear that the RFS is not only failing to achieve its environmental goals, but is actively undermining them.

B. Inadequate process for dealing with the failed cellulosic biofuel mandate

> "Do a good job cellulosic producers. If you fail, we'll fine your consumers."
> - U.S. Court of Appeals for the DC Circuit, opining on EPA's management of the cellulosic mandate. *API v. EPA*, 706 F.3d 474, 480 (D.C. Cir. 2013).

Cellulosic biofuels—produced from feedstocks such as corn stover, switchgrass and woodchips—are a subcategory of the advanced biofuels mandate. The RFS calls for 16 billion gallons of cellulosic biofuels in addition to the five billion gallon of non-cellulosic advanced biofuels in 2022. Putting aside the fact that there is no room left in the fuel mix for more ethanol, Congress was overly optimistic about the cellulosic industry's ability to meet these mandates.

Each year, EIA is required to send a letter to EPA detailing its estimates on cellulosic production for the following calendar year. EPA is required to take those estimates and to base its final proposal based on EIA's estimate. In 2010 and 2011, the RFS called for a combined 350 million gallons of cellulosic biofuel. Recognizing that the industry would not produce that much, EIA projected a combined total of 10.28 million gallons. EPA, in an attempt to provide a greater market for the still non-existent fuel, set the final mandates at 12.5 million gallons. Precisely zero gallons were produced. In 2012, the cycle repeated itself, as EIA projected 6.9 million gallons and EPA increased the mandate to 10.45 million ethanol-equivalent gallons. In 2012, the U.S. produced a total of 21,093 gallons- of

[18] EPA estimates about 80 percent of corn ethanol plants are natural gas fired, and 88 percent are drymill facilities.

which 20,069 were a demonstration batch shipped to the Rio+20 climate conference and thus unavailable for compliance. The company that produced those gallons recently declared bankruptcy.

Therefore, in order to stay in compliance with the RFS, obligated parties were forced to purchase "waiver credits" from EPA. A January 2013 court decision rescinded the requirement in 2012, but in 2010 and 2011, credits totaling about $5 million dollars were purchased. Unfortunately, EPA also denied petitions from the industry asking for a retroactive waiver recognizing that the fuel was not produced. In its proposed rule implementing the 2014 volumes, EPA proposed refunding the 2011 cellulosic biofuel waver credits to obligated parties, which AFPM supports.

Recognizing the absurdity of the situation, in January 2013 the U.S. Court of Appeals for the D.C. Circuit vacated the 2012 cellulosic mandate and admonished EPA to base the mandates using more realistic projections. Yet less than a week after the Court's decision, EPA doubled down and once again proposed raising the mandate, this time to 14 million gallons. Although EPA promulgated a final rule further reducing the cellulosic target to 6 million gallons, the cellulosic industry will not meet that target either. Through October, a total of only 360 thousand gallons of cellulosic biofuels were produced. For the cellulosic target, the annualized volume is only 432 thousand gallons- or 11 percent of the target EPA set in August.

EIA projects that cellulosic biofuel production will fall significantly below volumes envisioned by the RFS—reaching only 0.5 billion gallons by 2022. If the RFS remains in place, however, and if breakthroughs in technology and economics of cellulosic *ethanol* make it commercially feasible, requirements for these advanced biofuels will only exacerbate the ethanol blendwall problem.

C. Unintended consequence of increasing imports and emissions

As described previously, the mandate for other advanced fuels can only be met with by importing sugar-cane based ethanol, mainly from Brazil. At the same time, the U.S. is exporting corn ethanol to Brazil. This "fuel shuffling" between countries increases total GHG emissions due to unnecessary transportation that would not occur absent the RFS. In early July 2013, Thompson-Reuters released an analysis of U.S.-Brazil ethanol shipments and found that since 2011, one billion gallons of ethanol was exchanged between the two countries, producing more than 312,000 tonnes of CO_2.[19] According to the EPA, 8 million tree seedlings would need to be grown over the next decade to offset these emissions.

D. Another implementation consequence: biodiesel fraud

In November 2011, February 2012, and April 2012, EPA issued Notices of Violation (NOVs) to obligated parties that unknowingly purchased and used invalid RINS sold by EPA registered biodiesel producers. The fraud was perpetuated by three companies, which (in total) sold 140 million RINs to unsuspecting obligated parties. For context, 140 million RINs equaled approximately 5-12 percent of the biodiesel market during 2010 and 2011. These companies were registered by EPA, which required registration paperwork such as third-party engineering reports. In addition to fining the victims of the fraud (obligated parties), EPA forced those parties to go into the market and purchase replacement RINs—which cost more than $1.00 each and without obligated parties knowing whether they were valid. AFPM estimates that the fines and replacement RINs cost the industry nearly $200 million in 2012.

Although EPA worked with obligated parties, biofuel interests, and others to design a "quality assurance program" aimed at preventing future fraud, EPA's proposal is overly complex and expensive—increasing the likelihood that smaller renewable fuel producers will not take advantage of the voluntary certification. EPA took comments on the proposed rule, which closed on April 18, 2013, but has yet to finalize the QAP program. In the meantime, obligated parties and biodiesel producers

[19] Ali Morrow and Alex Plough, *Ethanol Trade Undermines U.S. Biofuels Policy*, Thompson Reuters Foundation (July 3, 2013), available at: http://www.trust.org/item/20130703091935-47h65/

alike face legal and regulatory uncertainty.

IV. EPA's Proposed Rule Implementing 2014 Volumetric Targets

On November 29, EPA released its proposed rule implementing the 2014 renewable blending targets. For the first time, EPA proposed a decrease in the mandated volumes of corn ethanol and to use its discretionary authority to waive the total advanced and total renewable categories by the amount of the cellulosic waiver.

A. 2014 Proposed Volumes

Importantly, and despite dire claims to the contrary, compared with current consumption levels EPA did not propose massive cuts in any of the buckets. In particular, obligated parties used approximately 13 billion gallons of ethanol in 2010, 2011 and 2012, will use approximately 13 billion gallons in 2013 (using banked RINs to meet the rest of the mandate), and so EPA's proposal of 13 billion gallons for 2014 merely continues status quo consumption. Given this fact, the ethanol industry's claim that EPA's proposal will somehow shutter ethanol plants and place jobs at risk rings particularly hollow. At the same time and as explained below, however, gasoline consumption is projected to decline yet again in 2014, indicating that EPA should reduce the volumes slightly further to avert the blendwall.

For cellulosic, EPA is actually proposing to more than double the 2013 mandate, despite the fact that the cellulosic industry has yet to exceed even 1 million gallons of production or meet its modest targets in any given year. For biomass-based diesel, EPA is already more than a year late in promulgating volumes for 2014, but maintained the same mandate for biomass based diesel for 2014 and 2015. The remaining difference in the numbers is EPA's decision to use its authority to reduce the total and advanced mandates by the amount it waived the cellulosic targets. In using this authority, EPA is essentially preventing a requirement to import ever increasing amounts of Brazilian sugarcane ethanol in order to meet the advanced biofuels mandate and the resulting exacerbation of the E10 blendwall. Although biomass-based diesel is also able to fill the non-cellulosic advanced biofuels mandate, it is also eligible to fill the total renewable mandate, so there will continue to be a market for higher biodiesel volumes than the biomass based diesel requirement alone would indicate.

B. Impact of the 2014 Volumes on the Blendwall and Need for Congressional Action

AFPM is pleased that EPA recognized the blendwall, but believes the final rule must go further to avert its full impacts. In August 2013, AFPM and the American Petroleum Institute filed a petition on behalf of its members seeking a partial waiver of the 2014 RFS. In its petition, AFPM detailed the technical and marketplace challenges associated with increasing the volume of biofuel in the fuel supply, and requested a waiver that would set the ethanol content in gasoline at an average of 9.7 percent, for a total 2014 RFS of 12.9 billion gallons of ethanol and 1.9 billion ethanol-equivalent gallons of biomass-based diesel. In 2013, available data through August indicate ethanol use is averaging 9.7 percent at a time when every incentive has been pushing towards more ethanol use. In particular, a 9.7 percent cap would retain a small market for gasoline containing no ethanol required for some applications (such as boating, older cars, and some lawn equipment), promote liquidity in the RIN market, and account for historical differences between the Energy Information Administration's (EIA) projections of gasoline demand and actual demand. EIA's data imply that 2012 E0 use was about 3.4% of gasoline demand and recreational boating alone was about 1.2% of demand. Unfortunately, EPA's proposal would place the average ethanol content at approximately 9.8 percent- precariously placing the RIN market on a cliff's edge.

Moreover, it is critical that Congress recognize the EPA proposal is not final, and—if finalized—is only valid for 2014. EPA would need to reassert its waiver authority each year, throwing the entire fuel market into disarray due to the uncertainty of the regulatory climate and near certainty of legal challenges. Nor does a year-to-year, lawsuit-to-lawsuit fuels policy allow for rational planning and investment choices, land use decisions, or stability in commodity markets that has helped bring such a

diverse set of interests together seeking reformation or repeal of the RFS.

For these reasons, Congress must act to bring long term stability and certainty back to the fuels markets by repealing or significantly restructuring the RFS.

V. Conclusion

Congress often sunsets legislation so that it may periodically reexamine laws to ensure they are meeting their intended goals and having their intended consequences. Unfortunately, there is no such mechanism in the RFS, which makes this hearing—and ultimately legislation---all the more critical. In 2007, the energy landscape was markedly different than it is today and policymakers did not have the wealth of information now available demonstrating the unintended consequences of biofuel mandates. Just as the European Union recently decided to roll back its biofuel mandates in response to concerns about the environmental and agricultural impacts, the U.S. Congress should look at the facts and take action to stem the consequences of this law before they grow worse. In addition to the technological innovations in oil and gas production leading to an energy renaissance in the U.S., we now know that the RFS is raising food and fuel costs, increasing GHG emissions, reversing advancements in air and water quality, and increasing the likelihood of engine damage. While the law is flawed at its core, its implementation has demonstrated the extent of the mandate's unworkability.

AFPM believes a two-step process is needed to alleviate the problems. Although it should go further, EPA is undertaking the first step to reduce the 2014 mandates using its discretionary waiver authority. This authority is merely a band-aid, however, as EPA's authority extends only a year at a time. Ultimately, Congress needs to take action to begin rolling back this unworkable and anti-consumer mandate – and soon.

Thank you again for holding this critical hearing. AFPM appreciates the opportunity to share its views.

Charles T. Drevna
President

American
Fuel & Petrochemical
Manufacturers

1667 K Street, NW
Suite 700
Washington, DC
20006

202.457.0480 office
202.552.8457 direct
202.457.0486 fax
Cdrevna@afpm.org

March 21, 2014

The Honorable Barbara Boxer
Chairman
United States Senate
Environment and Public Works Committee
410 Dirksen Senate Office Building
Washington, DC 20510

The Honorable David Vitter
Ranking Member
United States Senate
Environment and Public Works Committee
456 Dirksen Senate Office Building
Washington, DC 20510

Dear Chairman Boxer and Ranking Member Vitter,

The American Fuel & Petrochemical Manufacturers (AFPM) appreciates the opportunity to provide its views in response to questions after the Senate Environment and Public Works Committee's December 11, 2013 Hearing regarding the Renewable Fuel Standard. The following is AFPM's response to Committee members' questions for the record.

Question from Senator Carper

1. **Many small and mid-range refineries do not have the capabilities to blend and must buy many or of their RINs on the market. As a result, high and volatile RIN prices have had a large impact on these refineries. As the RFS continues, what can be done – besides removing the RFS – to assist these smaller refineries?**

   In 2013 the United States reached the E10 blendwall, which is the maximum amount of ethanol the nation can consume safely and efficiently utilizing existing infrastructure, automobiles, and other non-road engines (such as motorcycles, boats, and lawnmowers). As the mandates required more ethanol than the United States could safely consume, the market for compliance credits, or Renewable Identification Numbers (RINs) became tighter, driving both prices and volatility. This volatility affects all refiners. While some refiners may currently blend much of their own gasoline for resale, and thus obtain RINs with their purchased ethanol for blending, some merchant refiners do not blend any of their own finished gasoline, which means they must purchase RINs. Also, some large refiners may not own sufficient blending capacity to generate enough RINs to satisfy 100 percent of their annual obligation.

   Moreover, RINs in effect operate like permits to sell specific quantities of gasoline and diesel for U.S. consumption. The number of RINs available for compliance depends on the consumption of renewable fuels in U.S. transportation fuels. Therefore, as the Renewable Fuel Standards (RFS) mandates exceed the ability of the underlying fuel

supply and vehicle and infrastructure compatibility to accommodate additional amounts of renewable fuels, there will be a shortage of RINs for compliance. Independent analysis shows that the shortage of available credits provides a disincentive to produce a marginal gallon of diesel or gasoline and eventually limits supplies of gasoline and diesel for U.S. consumption. The economic impact of the blendwall is one of many examples of RFS' flaws. RFS implementation has demonstrated the extent of the mandate's unworkability and underscores the urgent need for Congressional action.

First and foremost, as Congress considers a comprehensive solution to the problems posed by the RFS, the only way to reduce current RIN price volatility is to address the challenges created by the blendwall. In general, consumer choice in a free market, and not Congress, should drive fuel mixtures and vehicle types. At a minimum, however, Congress should not mandate the use of fuels that cannot be safely and efficiently integrated into available infrastructure and engine fleets. The result is that obligated parties face no options for compliance and consumers are negatively impacted, as AFPM's written testimony explained in great detail. Beyond the blendwall and RIN market, there are a myriad of other issues that Congress needs to address in a comprehensive reform package.

Second, the Environmental Protection Agency (EPA) must issue final rules on time. The RFS requires EPA to finalize the annual final rule with regulatory obligations by November 30 of the previous year. This deadline is firm and non-discretionary. For 2013, the final rule was not released until August 2013, but was retroactive to January 1, 2013. EPA is already nearly four months late with the 2014 rule. An on-time final rule is necessary for all obligated parties to complete planning before the compliance period begins. The uncertainty created by EPA's late rulemaking is one factor in RIN price volatility.

Questions from Senator Gillibrand

1. **I understand that many different feedstocks can be converted to different finished fuels including synthetic diesel fuel and synthetic gasoline. What are the dominant production pathways for advanced biofuels and how much of the projected advanced biofuel capacity will be "drop-in" fuels that can be mixed with conventional hydrocarbons? Are there any issues with "drop-in" fuels?**

   In 2013, biomass-based diesel filled approximately 80 percent of the advanced biofuels mandate. The majority of biomass-based diesel is produced from soybean oil, which is also widely used in food preparation. Imported ethanol, primarily from Brazilian sugarcane, filled approximately 80 percent of the remaining advanced biofuels mandate. Approximately 100 million gallons of other advanced fuels, such as co-processed biodiesel and advanced (but non-cellulosic) ethanol, was produced domestically in 2013. For context, U.S. gasoline demand was approximately 132 billion gallons in 2013 and diesel demand was more than 50 billion gallons.

In the cellulosic category, the United States produced less than half a million gallons of cellulosic biofuel in 2013. The majority of this production was from KiOR, which operates a facility that produces cellulosic gasoline and diesel from woody biomass. KiOR recently announced that it would not produce any fuel during the first quarter of 2014, and in its March 17, 2014 10K filing with the SEC announced it had "substantial doubts about our ability to continue as a going concern." KiOR is the only domestic producer of drop-in fuels (other than biodiesel and renewable diesel) to date that AFPM is aware of in the RFS program.

In its 2013 Annual Energy Outlook, the Energy Information Administration (EIA) estimated that less than half a billion wet gallons of cellulosic drop-in fuel would be produced by 2030, and less than 4 billion gallons of total advanced and cellulosic biofuels would be available for compliance, including imports and biomass-based diesel. A recent analysis of existing and planned advanced and cellulosic biofuels capacity (excluding biomass-based diesel) indicates these projections may still be high. Taken at face value, however, there may be 1.7 billion gallons of advanced drop-ins and cellulosic biofuel available worldwide, excluding biomass based diesel and Brazilian sugarcane ethanol. Whether these fuels are actually produced and available for RFS compliance, however, is a different story. These are rough estimates of current and planned capacity for cellulosic and advanced alcohol fuels and drop-ins:

1. **Alcohol Fuels (e.g., cellulosic ethanol and butonal)**: Approximately 0.7 billion gallons of capacity for cellulosic and advanced ethanol is planned worldwide in the next several years. Current claimed capacity for advanced and cellulosic ethanol, however, is only 50 million gallons worldwide with only a small portion in the United States.
2. **Drop-In Fuels**: Approximately 1 billion gallons of planned capacity worldwide, 75 percent of which is outside the United States. With KiOR's recent announcement and other idled plants, existing domestic capacity is virtually non-existent.

It bears repeating that these projections are for worldwide production, not just U.S., so the impact on RFS compliance is uncertain at best. Finally, biomass-based diesel also comes with its own challenges. In particular, it has lower energy content than petroleum diesel, and it is significantly more expensive to produce than petroleum diesel. In the summer of 2010, Massachusetts suspended its biofuel content mandate for diesel and heating fuel because it is not feasible on the basis of unreasonable cost.[1] New Mexico has announced many temporary suspensions of its biodiesel mandate (April 13, 2012; October 16, 2012; May 1, 2013: and October 29, 2013[2]). Finally, EPA has uncovered

[1] http://www.mass.gov/eea/docs/doer/renewables/biofuels-mandate-announcement-jun302010.pdf
[2] http://www.nmda.nmsu.edu/wp-content/uploads/2013/10/Temp-Suspension-of-Biodiesel-Mandate-10-29-13.pdf

170 million fraudulent RINs in the biofuels industry, all of which have been biodiesel RINs.

2. **The advanced biofuel industry has been confronted with several challenges since the initial output expectations set with the Renewable Fuel Standard in 2007. To what extent has the advanced biofuel industry surmounted the original difficulties of access to capital and slow commercialization? How do the potential hurdles of the blend wall and soft domestic energy market represent new constraints? What are your preferences for the type of federal assistance that could provide the most expedient and useful tools for rapid acceleration of advanced biofuel production and use?**

   The advanced biofuels industry has grown in two areas but has lagged well behind Congressional targets in others. First, despite being produced primarily from food crops, biodiesel is classified as an advanced biofuel, and its market grew from 304 million gallons of consumption in 2008 to approximately 1.3 billion in 2013. The other growth industry is sugarcane ethanol, also an advanced biofuel, from Brazil. The U.S. market for imported Brazilian ethanol in 2013 was approximately 500-600 million gallons annually.

   As explained in the answer to Sen. Gillibrand's first question, growth in other advanced domestic biofuels and cellulosic biofuel have been virtually non-existent. However, to the extent that cellulosic and advanced ethanols are commercialized, they face the same blendwall challenges as corn-based ethanol. In other words, second generation ethanol will compete with corn ethanol and sugarcane ethanol under the same technical and market constraints that exist today.

   AFPM does not oppose the use of biofuels, and many of our members are some of the largest producers of biofuels and investors in biofuel interests. However, AFPM believes consumer choice should guide the fuel markets, not federal mandates.

Questions from Senator Vitter

1. **Assuming EPA's waiver methodology is in place annually, if you had your choice between status quo or making reforms to the program, which would you choose?**

   AFPM is encouraged that EPA recognized the existence of the blendwall. However, EPA did not provide a large enough waiver to avert the impacts of the blendwall, and the Agency's methodology leaves serious questions about how it will be implemented in the future. Specifically, the methodology would still require an annual determination by EPA on how much of biofuels can "reasonably be consumed," suggesting an annual debate on required biofuel volumes. EPA's tardiness in finalizing the rule and senior personnel's comments about potential revision is creating tremendous uncertainty for fuel producers. Furthermore, although the blendwall is a significant challenge, it is not the only problem with the program. Refiners are still faced with an obligation to buy credits

for fuels that do not exist, uncertainty in the biodiesel market due to ongoing RIN fraud, and multiple program implementation issues that need to be addressed, including establishing annual requirements on time. EPA's proposal to waive the statutory mandates in 2014 is a welcome and needed short-term solution, but it is clear Congressional action is needed to address the full spectrum of issues with the RFS.

2. **In your testimony you suggest capping ethanol content in gasoline at 9.7%, but it has been said that engines and associated systems are generally able to accommodate up to 10%, or E10. Why is 9.7% your suggested cap?**

   AFPM petitioned EPA for a waiver to an average ethanol content in gasoline of 9.7 percent for several reasons. First, there is a need for pure gasoline without ethanol in some applications, notably older cars, boats, and other non-road equipment, as well as state laws requiring industry to provide E0 to some marketers. Second, a 9.7 percent average would retain some liquidity in the RIN market and curtail some of the volatility the industry experienced in 2013. Finally, EIA has historically been slightly inaccurate in its gasoline demand forecast for the following year. A 9.7 percent target would ensure flexibility if gasoline demand were to fall below EIA projections.

3. **Does EPA's proposed 2014 RVO reduce the corn ethanol target? Does it reduce the cellulosic target?**

   In 2013, the RFS implied a conventional mandate being met by corn-based ethanol of 13.8 billion gallons; however, a significant portion of the mandate was met using banked RINs from previous years. In fact, EIA reports that ethanol consumption in the United States has remained steady at about 13 billion gallons for the last four years.[3] EPA's proposal for 2014 implies 13.01 billion gallons for conventional biofuels (primarily corn ethanol) and 280 million gallons for advanced biofuels beyond the proposal for biomass-based diesel (an opportunity for sugarcane ethanol). Therefore, if EPA's proposal holds, ethanol consumption in 2014 could remain very similar to the last four years.

   EPA's proposal waives the cellulosic target from the statutory volume, but increases it from the 2013 mandate. The statutory target for cellulosic biofuel was 1 billion gallons in 2013 and 1.75 billion gallons in 2014. Due to the lack of production, EPA finalized a 6 million gallon target in 2013, of which less than 1 million gallons was actually produced. Despite the missed 2013 target, EPA proposed raising the volume to 17 million gallons for 2014. AFPM has significant concerns that this number will be missed again and obligated parties will be required to stay in compliance by writing checks for fuels that do not exist.

[3] http://www.eia.gov/totalenergy/data/monthly/pdf/sec10_7.pdf

4. What is the biggest impact of the proposed 2014 RVO?

EPA's proposed 2014 Renewable Volume Obligation (RVO) recognizes the onset of the E10 blendwall and the challenges in advanced and cellulosic categories. The proposed rule, however, is only a short-term solution to a piece of the problem and has not yet been finalized. Congress must provide long-term certainty and address the multiple problems with the RFS.

5. General Clark on behalf of Growth Energy as well as Mr. Coleman on behalf of the Advanced Ethanol Coalition suggest that refiners use franchise agreements or contracts to prohibit or block higher ethanol blends? Is that accurate?

As a general matter, franchisees are free to sell higher ethanol blends. Nothing in the typical franchise agreement or anywhere else prohibits them from doing so. A franchisee merely needs to make the necessary investment in equipment and infrastructure to sell the higher ethanol blends, and they are free to make these decisions based on their own competitive decisions and the demands of the marketplace.

In fact, a series of laws exist that protect the ability of franchisees to make the decision to sell renewable fuels, including the Gasohol Consumption Act (GCA) and the Petroleum Marketing Practices Act (PMPA). The PMPA in particular protects both franchisees and franchisors by ensuring that franchisors have two grades of gasoline being sold while barring a franchise agreement that prevents franchisees from carrying higher ethanol blends as a third grade of fuel, thus ensuring a franchisee's ability to make the investments needed to store and sell higher ethanol blends.

In addition, according to the Government Accountability Office (GAO), more than half of stations nationwide are unbranded stations, not franchises. These stations are free to sell E85 or E15, but have chosen not to carry these fuels because of a lack of consumer demand and fear of potential liability. In general, franchisees get the benefit of a steady fuel supply at a contracted price, marketing assistance, and the ability to use a refiner's trusted brand to help sell fuel. Typically, in return, franchisees must sell at least two grades of the refiner's product. However, franchisees are free to sell E85 or E15 (and to install the necessary equipment to do so) if they meet their contractual obligations to sell the franchisor's products. Put another way, franchisees are getting the benefit of a contractual bargain between two private parties- the definition of a free market. Those franchisees are free to sell unbranded fuel if the contract is not in their best interest, as about half the nation's fuel retail stations already do.

6. **Is it accurate for ethanol advocates to state that ethanol is saving the American consumer money?**

   A gallon of gasoline contains 50 percent more energy than a gallon of ethanol. According to EIA, on an energy-adjusted basis, ethanol is more expensive than gasoline - meaning it costs consumers more to travel the same distance. The AAA Fuel Gauge Report tracks an energy-adjusted price comparison for E85 vs. regular gasoline, and E85 is virtually always more expensive.[4]

7. **Can you explain retail ownership, in other words who owns the majority of retail gasoline and diesel stations? How much of the retail market is franchised? How much is operated by refiners? Does the makeup of the retail ownership impact RIN trading?**

   According to the GAO, approximately half of the 156,000 retail stations are unbranded, and more than 95 percent are independently owned. This means that obligated parties own less than 5 percent of retail and do not control decisions, including pricing and equipment investment, at the retail level. The RFS places compliance obligations on refineries that do not control point of sale decisions or consumer choice. This is a significant flaw in the program and undoubtedly adds to RIN volatility and winners and losers in the fuels market.

8. **What has changed in the energy markets since enactment of the RFS2 in 2007? Does that impact the need for the RFS2?**

   The U.S. energy market has changed profoundly since 2007. In particular, significant increases in domestic crude production have reduced U.S. reliance on imported oil from 60 percent of demand to less than 40 percent.[5] This trend is projected to continue, benefiting U.S. energy security and national security. At the same time, U.S. demand for gasoline is declining. The EIA now projects gasoline demand will be 14 percent lower in 2014 than it projected in 2007. The difference will widen in the coming years as EIA's current annual energy outlook shows gasoline demand will be 28 percent lower in 2022 than it projected in 2007.[6] Declining gasoline demand and rising biofuel mandates have exacerbated the onset of the E10 blendwall.

   Finally, the United States did not fully anticipate its reliance on imports for meeting the advanced biofuels mandate. As described in our answers to Sen. Gillibrand, sugarcane ethanol from Brazil accounted for approximately 80 percent of the non-biomass-based diesel portion of the advanced biofuels mandate in 2013. Since this is not a domestic

[4] http://fuelgaugereport.aaa.com
[5] Petroleum net imports as a percent of product supplied; http://www.eia.gov/totalenergy/data/monthly/pdf/sec3_7.pdf
[6] Energy Information Administration, 2014 Annual Energy Outlook early estimate

industry, it does not represent a supply of domestic biofuels and likely crowds out new domestic advanced biofuels that may not be as cost competitive.

Questions from Senator Barrasso

1. **Would you elaborate on why it is necessary for EPA to reduce the total volume of renewable fuels under the RFS?**

   First, notwithstanding more than five years of mandates, the amount of cellulosic produced has never exceeded 1 million gallons. A 1.75 billion gallon mandate in 2014 is technologically impossible to meet. If EPA does not reduce the advanced biofuels mandate and the overall mandate when it reduces the cellulosic mandate, the difference will be filled with (primarily) biodiesel and imported sugarcane ethanol. In 2014, even if it were the intent of the RFS to allow this backfill, there is not enough biodiesel or sugarcane ethanol to meet those targets. Second, the blendwall constrains the amount of ethanol that can be consumed in 2014 to about 13 billion gallons. A reduction in the advanced category prevents the need to import sugarcane ethanol for compliance, and further reductions are necessary to ensure U.S. consumers do not face the significant adverse impacts of the blendwall.

2. **Is it correct that your organization would like EPA to make further reductions in its final rule?**

   AFPM petitioned for a lower 2014 RVO than EPA proposed. The primary driver for an overall volume of 14.8 was to set the average ethanol content in gasoline at 9.7 percent of projected gasoline demand. As we described in our answer to Sen. Vitter's second question, AFPM petitioned EPA for the 9.7 percent target for several reasons. First, there is a market for pure gasoline in some applications – notably older cars, boat, and other non-road equipment – as well as state laws requiring industry to provide E0 to some marketers. Second, a 9.7 percent average would retain some liquidity in the RIN market and curtail some of the volatility the industry experienced in 2013. Finally, EIA has historically missed its gasoline demand forecast for the following year. A 9.7 percent target would ensure flexibility if gasoline demand were to fall below EIA projections. The table (units are billions of gallons) below shows a comparison of EPA's proposal and AFPM's request for 2014:

	EPA's proposal	AFPM
Total renewable fuels	15.21	14.8
Advanced biofuels	2.20	1.92
Biomass-based diesel	1.28	1.28
Cellulosic biofuel	0.017	very small

   This shows agreement on the volume for biomass-based diesel.[7]

[7] 1.28 bg actual, or 1.92 ethanol-equivalent bg

3. **Would you explain why EPA's rule is, at best, a temporary solution and why Congress still needs to repeal the RFS in its entirety?**

   EPA's proposal, even if adopted in its current form, only begins to address one aspect of this fundamentally flawed program. Numerous issues remain, including implementation issues, ongoing RIN fraud in the biodiesel sector, and continuing requirements for obligated to pay for fuels that are not commercially available. In addition, serious questions remain about the RFS' impact on other stakeholders, including food and animal agriculture producers, engine manufacturers, restaurateurs, and ultimately consumers.

   It is clear that the RFS has not achieved its intended goals and is leading to a host of unintended consequences. The U.S. energy outlook has also fundamentally changed, making the RFS both obsolete and a hindrance to more efficient and affordable fuels. For these reasons, Congress should repeal the RFS.

AFPM appreciates the opportunity to address these questions and to provide its views. Please contact me with any further questions.

Sincerely,

Charles T. Drevna
President, AFPM

Senator BOXER. Thank you, sir.

I wanted to mention for the benefit of everyone watching that our first two witnesses were majority witnesses. Our last witness is a minority witness. Our next witness is a bipartisan witness, and that is Mr. Jon Holzfaster, owner and operator of a farm. And we welcome you.

STATEMENT OF JON HOLZFASTER, OWNER AND OPERATOR, HOLZFASTER FARM

Mr. HOLZFASTER. Thank you. Chairman Boxer, Ranking Members Vitter and Sessions, thank you for the opportunity to testify about our Nation's domestic renewable fuels. Senator Fischer, thank you for your earlier introduction. Go Huskers.

[Laughter.]

Mr. HOLZFASTER. My name is Jon Holzfaster. I have been farming for 27 years in Southwest Nebraska. I run a cattle feeding operation and use ethanol blends on 30 percent on my farm. I grow corn, soy beans, popcorn, wheat, and alfalfa. I serve on NCGA's Corn Board and Chair their NASCAR Advisory Committee. I previously served as their liaison to the National Cattlemen's Beef Association.

NCGA was founded in 1957 and represents 40,000 dues-paying corn growers. Corn is important globally as food, feed and fuel. It is possibly the most versatile crop in the world, and demand is at an all-time high. The RFS is a critical piece of our Nation's energy policy. In 2012, the RFS supported more than 300,000 jobs, displaced over 450 million barrels of imported oil, lowered gas prices at the pump by nearly $1, all while improving the environmental footprint of our Nation's transportation fuels.

I am proud to say that farmers work hard to be good stewards of the land and environment. Corn farmers have responded to demand by producing more corn on approximately the same amount of land. In the last 30 years, corn production has improved in all measures of resource efficiency, land use, soil erosion, water use, energy use and greenhouse gas emissions.

Corn ethanol is one of the most successful components of our Nation's renewable energy policy. Despite this, several environmental groups choose to ignore scientific evidence and side with the oil and gas industry instead of embracing a renewable energy resource grown here at home.

With the emergence of the ethanol industry, U.S. farmers have responded to demand by growing significant larger corn crops while using significantly fewer inputs. Of this increased crop, 40 percent was used for livestock feed and 31 percent for ethanol production.

During the ethanol production process, two other co-products are made, corn oil, which is used for biodiesel production, and dried distiller's grains. According to the U.N. Food and Agricultural Organization, DDGs have become the most popular feed ingredient used in beef, dairy, swine and poultry diets. I feed locally produced DDGs to my cattle in my feed yard. If I did not have access to this product, I would seriously consider eliminating cattle feeding from my operation.

We have heard criticism that the production of ethanol has forced land out of the Conservation Reserve Program. However,

this is not true. General CRP sign-up acreage has decreased, but continuous sign-ups have increased and still target the most environmentally sensitive land. The land that is considered environmentally sound is returned to production.

There are over 20 ethanol plants operating in Nebraska. This gives me multiple competitive options for marketing my grain, options that exist because of the commitment that Congress made establishing the RFS. Before these ethanol plants were built, a high percentage of the corn in our area was exported. Now virtually every bushel is transformed into fuel and feed locally. That value is captured and multiplied throughout our communities, generating economic vitality and tax revenue.

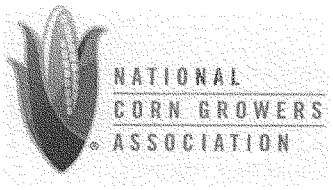
Decisions affecting next year's crop have already been made. In the past, the RFS has provided some certainty that there would be a viable commodity market. But EPA's proposed rule eliminates this certainty. Based on USDA commodity costs and returns, current market prices fall below the price of production. This recent decline in the price of corn is the largest drop in prices in six decades. Combined with increased input costs and lower crop prices, it would no longer be viable for farmers to provide the resources as they do.

NCGA appreciates this Committee's and Subcommittee's work to understand our perspective and we strongly believe the RFS is doing exactly what it is intended to do.

I look forward to hearing testimony and answering questions.

Thank you.

[The prepared statement of Mr. Holzfaster follows:]



National Corn Growers Association

Testimony of

Jon Holzfaster
Owner and Operator, Holzfaster Farm

before the

United State Senate
Committee on Environment and Public Works and
Subcommittee on Clean Air and Nuclear Safety

Oversight Hearing on Domestic Renewable Fuels
December 11, 2013

Chairwoman Boxer, Ranking Member Vitter, Chairman Carper and Ranking Member Sessions, thank you for the opportunity to testify about the impacts of the Renewable Fuel Standard on our nation's domestic renewable fuels.

My name is Jon Holzfaster and I have been farming for 27 years in Perkins County, Nebraska. Not only do I run a cattle finishing operation, but also farm corn, soybeans, popcorn, wheat and alfalfa. I currently serve on the Corn Board for the National Corn Growers Association and chair the NASCAR Advisory Committee. I have previously served as the Corn Board's liaison to the National Cattlemen's Beef Association and was a member of NCGA's Ethanol Committee for nine years. NCGA was founded in 1957 and represents over 40,000 dues-paying corn growers. NCGA and its affiliated state associations work together to help protect and advance corn growers' interests. Corn is important globally, as a food ingredient, an animal feedstock, a fuel, and beyond. It is possibly the most versatile crop in the world and demand is at an all-time high.

The Renewable Fuel Standard (RFS) is a critical piece of our nation's energy policy. Since its enactment in 2005, it has accomplished what it was designed to do, namely, it has created jobs, lessened our dependence on foreign oil and thereby increased national security and improved the environmental footprint of our nation's transportation fuels. In 2012 alone, the RFS supported more than 300,000 jobs across the country, displaced the equivalent of 465 million barrels of imported oil, and lowered the price consumers paid at the pump by nearly a dollar per gallon. It also spurs innovation and helps drive the development of advanced and cellulosic biofuel facilities. In short, it is doing exactly what it was designed to do – spur the development of a significant alternative to petroleum that ignites economic development for those who produce these new fuels and for those who use it.

Due to increasing yields in agricultural production, farmers have avoided clearing additional acres of land that would have been required to produce the same amount of food. In the last 30 years, corn production has improved on all measures of resource efficiency, by *decreasing* per bushel: land use by 30 percent, soil erosion by 67 percent, irrigation by 53 percent, energy use by 43 percent and greenhouse gas (GHG) emissions by 36 percent.[1] All of these improvements have continued despite the increased demand of corn for ethanol.

This testimony will provide an overview of the manner in which the Renewable Fuel Standard has positively impacted the domestic renewable fuel supply and the agriculture sector by reducing greenhouse gases, creating jobs and promoting rural development, and allowing our nation to grow our energy at home.

ENVIRONMENTAL BENEFITS

Between 1900 and 2012, the world's population grew from 1.6 billion to more than 7 billion. The Food and Agriculture Organization of the United Nations estimates that the world's population will increase to 9 billion by 2050. With the increased demand for conventional agriculture, it is more important than ever to produce crops today while looking towards the future health of the planet. Corn farmers work hard to be good stewards of the land and environment while producing crops that will be used for animal feed, fuel, food and hundreds of other applications. Farmers know first-hand that they must embrace and seek practices that will sustain the soil and climate to produce the crops of the future.

Fortunately, U.S. agriculture has made incredible technological advances. In 1960, the average U.S. farmer fed 26 people; today, due to these advances, the number has increased to 155 people. In fact, in the last 30 years, corn production has improved on all measures of resource efficiency. Crops have doubled between 1980 and 2009 by only planting just 3 percent more acres. All of these improvements have continued while the ethanol industry has increased corn demand.

With increasing yields in agricultural production, farmers have avoided clearing additional acres of land that would have been required to produce the same amount of food. The impact of the higher yields has curbed greenhouse gases equal to a third of the total emissions since the dawn of the Industrial Revolution in 1850. No other industry can claim to have done more. A 2010 study[2] from Stanford University found that advances in high-yield agriculture have prevented massive amounts of GHG from entering the atmosphere, the equivalent of 590 billion metric tons of carbon dioxide (CO_2). In fact, the study concludes that "improvements of crop yields should therefore be prominent among a portfolio of strategies to reduce global greenhouse gas emissions."

Not only have significant advancements been made in agriculture but also in corn ethanol production. According to a recent report issued by the Global Renewable Fuels Association, ethanol production and use was estimated at reducing GHG emissions by 100 million metric tons in 2012 alone, equivalent to removing 20.2 million light duty vehicles from the highways.

---

[1] "Environmental and Socioeconomic Indicators for Measuring Outcomes of On-Farm Agricultural Production in the United States" Field to Market: The Keystone Alliance for Sustainable Agriculture, July 2012.
[2] http://news.stanford.edu/news/2010/june/agriculture-global-warming-061410.html

While a definite reduction in GHG emissions is clear, the reduction is underestimated for multiple reasons. First, corn yield improvements have increased at a rate of 2.1 percent per year for the last 35 years (including the drought from 2012) - a huge gain reflected in several contributing categories. This increase in yield decreases the amount of land needed to grow corn. In addition, fertilizer use, especially nitrogen, has decreased per unit of grain produced. Fertilizer production and usage are the most intensive GHG emission contributors to farming; the amount of fertilizer needed to produce the same amount of grain has decreased in the last 30 years and, thus, so has the GHG intensity of U.S. farming. Furthermore as yields increase, farmers are able to harvest a portion of the corn stalks/cobs, known as stover, normally left in the field. Stover can be used as animal feed or as a cellulose feedstock for ethanol production.

Second, the EPA underestimated the rate of improvement in corn ethanol process technologies. As shown in Table 1, the values EPA estimated in 2008 for ethanol production in 2012 were significantly lower than recently measured.

Table 1: Comparison of fuel production for ethanol, EPA estimated vs. actual

Energy or GHG emissions	EPA value (estimated in 2008 for 2012)	Actual value (determined in 2012)[3]
Natural Gas, BTU/gal	33,032	23,862
Electricity, kWh/gal	0.780	0.750

Additionally, when the renewable fuel standard was developed, corn ethanol plants made two products, ethanol and distillers dried grains (DDGs). DDGs are a valuable high protein product which is used to feed livestock. Today, most ethanol plants also produce corn oil, which is used to produce biodiesel or fed to the livestock industry. Although the EPA anticipated the development of a corn oil industry, it dramatically underestimated the speed of technology adoption. This underestimation results in higher calculated energy requirements for processing the DDGs.

Third, baseline emissions determined for petroleum-derived fuels did not take into consideration real-world scenarios thereby underestimating their emissions. Increasing amounts of U.S. petroleum feedstock derived from tar sands, and sour, heavy crudes have significantly higher GHG emissions than conventional hydrocarbons. The old baseline is no longer appropriate since petroleum feedstock are becoming more energy and GHG emission intensive.

Fourth, current indirect GHGs are overestimated for biofuels while the indirect GHG for petroleum fuels are simply omitted. Thus, the actual improvements being made far exceed the estimated numbers. Today, EPA considers the total GHG emission value of gasoline from petroleum as 91.54 g CO_2/MJ of fuel (baseline 2005 value) vs. 77.56 g CO_2/MJ of ethanol from corn (calculated for 2022). When all of these optimizations are taken into consideration further improvements in GHG savings would be more evident. In fact, a case can be made to demonstrate that corn starch ethanol today produces nearly 50 percent less GHG emissions than petroleum, as shown in Table 2. This represents tremendous advancements in agriculture and corn starch to ethanol production technologies.

[3] Mueller, S. et al. (2013). 2012 Corn ethanol: emerging plant energy and environmental technologies, available: http://www.erc.uic.edu/PDF/mueller/2012_corn_ethanol_draft4_10_2013.pdf

Table 2. Comparison of GHG emissions for petroleum and corn ethanol

	Petroleum	Corn Ethanol	Corn Ethanol (including optimizations)[3,4]
Direct GHG g CO_2/MJ	91.54	41.39	46.4
Indirect GHG g CO_2/MJ	0*	30.17	2.14
Total g CO_2/MJ	**91.54**	**77.56**	**48.58**

*Note that petroleum has no indirect GHG accounting.

Fifth, during the process of indirect land use change (ILUC) calculations, the sum of the land use change attributed to each of three primary feedstock investigated (corn, soybeans, and sugarcane) is much higher than the land use change determined and utilized when all three feedstocks are modeled together.[5] This inconsistency results in a dramatic overestimation of the value for the ILUC emission factor and determining the GHG emissions that biofuels have provided. Despite recent improvements and refinements of the models, large uncertainties and shortcomings still exist. Thus, serious inaccuracies have resulted in final number calculations and are reflected in a less than optimal value for biofuel.

In the five years since Energy and Independence and Security Act (EISA) was enacted and EPA modeled ILUC, significant advances to the art of calculating ILUC have been developed. This, combined with improved models as well as empirical evidence, illustrate that the initial calculations by the EPA grossly over predicted the ILUC impacts to renewable fuels and negatively impacted the true value of reductions in GHG emission savings for corn starch ethanol. American agriculture and corn ethanol processing are lowering the GHG intensity of ethanol, and are producing more products using fewer resources. We fully expect this trend to continue as both farmers and ethanol producers continue to become more efficient.

ENERGY SECURITY AND NATIONAL SECURITY

The U.S. government has invested and continues to invest in alternative energy resources as a means to increase national security. This has been done through a series of funding initiatives to government, academic, and private organizations. The foresight of this nation's leaders has supported the abilities of our citizens and provides one of the hallmarks of this country to produce some of the most advanced technologies in the world.

One of these initiatives is the RFS, which has contributed to U.S. energy security by providing an affordable and domestically produced alternative to oil while decreasing greenhouse gas emissions. The recent proposed rule issued by the EPA to lower the 2014 RFS volume

[4] Lifecycle greenhouse gas emissions were estimated for a corn ethanol pathway that includes collecting corn stover and substituting it for corn grain in cattle feed plus the isolation of corn oil during ethanol production. Using stover as feed results in a GHG credit for the displaced corn. The credit includes the energy inputs and emissions associated with corn farming and transport of corn as well as reduced indirect land use change (ILUC) emissions associated with corn farming. ILUC is defined as the conversion of forests and other natural lands around the globe to agriculture to replace grain or cropland diverted to biofuels.

[5] RFA Letter to EPA. August 4, 2010. http://renewablefuelsassociation.createsend1.com/t/y/l/qhyitk/kuluiiuhh/y

obligations would be devastating to the structure already established. By reducing the RVOs to fuel levels below what can already be created, it disrupts the foundation of a successful program that combats GHG emissions and provides a domestic, renewable fuel supply.

Another mechanism has been through the Corporate Average Fuel Economy (CAFE) Standards, which decreases vehicle fuel consumption through increased mileage requirements. The continued support of methods to decrease the use of, and provide alternatives to, the consumption of energy while preserving the environment are critical to sustaining the planet for future generations – something farmers have been doing for generations.

As a result of these and other commitments from the government, the United States is now more energy secure than it was prior to the implementation of the RFS. The production of more than 40 billion gallons of biofuel, mainly ethanol, in the last four years has provided an alternative to petroleum while decreasing GHG emissions. Reliance on foreign oil has decreased from 60 percent in 2005 to 40 percent today due to several factors including decreased usage, greater automobile fuel efficiency and a replacement of 10 percent of the gasoline supply with ethanol.

Since gasoline production is responsible for approximately 45 percent of U.S. oil consumption,[6] a 10 percent decrease in gasoline consumption corresponds to an approximately 4.5 percent decrease in overall oil consumption. Additionally, the shift in the United States from being a net importer of gasoline in 2006 to a net exporter in 2012 averaging 366,000 barrels per day is noteworthy. While this shift has occurred, the production and utilization of 870,000 barrels per day of ethanol (equivalent to 13 billion gallons) has enhanced the U.S. gasoline supply. Ethanol allows for a decreased reliance on foreign oil and contributes to the U.S. fuel supply such that gasoline can be exported.

In addition to creating a stable energy supply, the RFS has also had a positive impact on gas prices. Ethanol prices have typically been substantially below gasoline prices at the wholesale level in recent years. For the first five months of 2013, ethanol prices in Chicago have averaged $2.48 per gallon, while gasoline prices have averaged $2.96 per gallon in Chicago (wholesale prices in Chicago were utilized since it is the central pricing point for ethanol and the regulatory conditions for gasoline are not as varied as on the East and West Coasts). This 48 cent-per-gallon discount translates to a gross benefit of almost $0.05 per gallon of finished motor gasoline supplied to consumers.[7] This does not take into account either the indirect benefit that ethanol has on gasoline prices by effectively lowering demand for gasoline (a benefit especially in past years when refineries were running close to capacity) or the enhanced octane value of ethanol over gasoline.

Today, 95 percent of the nation's light-duty vehicles run on a blend of 10 percent ethanol with gasoline. This represents over 13 billion gallons of ethanol. In the last several years, due to partnerships between the ethanol and corn industries and with the help of some state American Lung Associations, higher blends of ethanol, namely E85, have been introduced into the retailer infrastructure. Approximately 3200 retail stations offer E85 and in addition, with the recent approval of E15, eleven states now have 50 retail stations offering this option to consumers. This

[6] According to the U.S. EIA "U.S. refineries produce about 19 gallons of motor gasoline from one barrel (42 gallons) of crude oil. The remainder of the barrel yields distillate and residual fuel oils, jet fuel, and many other products. http://www.eia.gov/tools/faqs/faq.cfm?id=24&t=6.

[7] Most gasoline contains 10% ethanol, thus price reduction is 10% of $0.48

additional infrastructure has provided the means for distributing mainly corn starch derived ethanol. With the advent of second generation fuels, namely ethanol from corn stover plants and other non-corn starch derived ethanol, this same infrastructure will be in place to distribute this renewable fuel to our nation's consumers. Thus, even though it was expected that the petroleum industry would utilize the RIN system for infrastructure, the ethanol and corn producers have stepped up to provide the necessary infrastructure for renewable fuel consumption. Infrastructure has kept up with the increased volumes of biofuels as directed by the RFS and is on track to continue to do so. However, this industry faces continuing challenges by the petroleum industry on E15 and E85 pricing and availability as well as inconsistent and non-science based policy blocks regarding physical properties of E15 (Reid Vapor Pressure, RVP).

BENEFITTING RURAL DEVELOPMENT AND CREATING JOBS

The expansion of the ethanol industry has catalyzed substantial growth in the agriculture sector's output, efficiency and value. The role of the RFS has been to create a certain and stable market environment for renewable fuels producers and feedstock providers. In turn, this certainty has enabled investment in new agricultural technologies, such as more efficient farm machinery and higher-yielding corn seed. Agricultural gross domestic product (GDP), net farm income, livestock receipts and crop receipts have all hit new record highs in recent years indicating that the net impact of ethanol expansion on the agriculture sector has been resoundingly positive.

Expansion of the ethanol industry of the past decade has created and/or supported tens of thousands of jobs across all sectors of the economy. In 2012 alone, the RFS supported more than 300,000 jobs across the country.[8] While it is difficult to assess how much of the increase in farm revenue is attributable to RFS demand versus increased export demand, farm income has risen.

My farm sits in the very heart of Nebraska corn country—and there are over twenty ethanol plants within my state. This has provided me with a number of competitive options for marketing my grain—options that exist because of the promise and the commitment that Congress made in establishing the RFS. The investments by ethanol production companies—and their shareholders, including corn farmers themselves—have been predicated on a national strategy of increasing our domestic fuel supply through renewable fuels such as ethanol and biodiesel. These companies and investors have committed themselves to the long-term viability of renewable fuels, based on the commitment that Congress made in establishing the RFS.

Before these ethanol plants were built, a high percentage of the corn in our area was exported to domestic or international markets—shipped out as raw corn, sold at the going price. Now virtually every bushel is transformed into fuel and feed—adding considerable value to every kernel. That value is captured and multiplied several times throughout the communities in my area—generating economic vitality and tax revenue. The economic vitality that the RFS has spurred in rural America extends well beyond my farm. I see the impact of increased tax revenue for our county to build roads and provide services. I see main street businesses with customers in the aisles. I see entrepreneurs starting new ventures—many of which are based in agriculture and food production.

Despite the negative effects of the ongoing recession in the manufacturing sector, agricultural equipment manufacturers have been largely immune to the downturn. This is solely because as

[8] Renewable Fuels Association.

farm income has risen, farmers have expanded and recapitalized their operations. A large part of this recapitalization is new equipment purchases. Likewise, as farm returns and income have risen, land prices have also risen. This has expanded the property tax base in rural America which is vital to funding schools, roads and other public services. Finally, according to the USDA, total net agriculture income has risen since the passage of the RFS. In 2006, average farm income was $57.4 billion. In 2012, farm income was $112.8 billion, a 97 percent increase. As Table 3 indicates, while farm income has increased, this increase was not solely in the crop sector. Livestock receipts have increased over this time period as well.

Table 3: Income Statement for the U.S. Farm Sector (billion $)

	2006	2007	2008	2009	2010	2011	2012F	2013F
Crop Receipts	122.1	150.1	175.0	168.9	179.6	208.3	219.6	216.3
Livestock Receipts	118.5	138.5	141.6	120.3	141.6	166.0	171.7	176.5
Gross Income	290.2	339.5	377.7	343.3	365.6	428.5	446.5	481.1
Total Expenses	232.8	269.5	292.6	280.3	285.2	310.6	333.7	352.9
Net Farm Income	57.4	70.0	85.1	63.0	80.4	117.9	112.8	128.2

U.S. meat output has grown steadily since the original RFS was enacted in 2005. In fact, 2013 production of red meat and poultry is projected to be the second-highest on record (only behind 2008) and 7 percent higher than output in 2005.[9] If, as some critics claim, the RFS has been overly detrimental to the livestock industry, annual meat production should have declined post-RFS. This can also be used as a proxy for employment in the meat sector. A decline in meat production would have resulted in a loss of jobs. This is not to say some companies did not bear the brunt of the change, but overall the sector appears to have increased production.

While the emergence of the ethanol industry has increased demand for corn, U.S. farmers have responded by growing significantly larger corn crops. The average annual U.S. corn crop averaged 7.2 billion bushels (bbu.) in the 1980s and USDA estimates 14 bbu. for 2013. Of this increased crop, 39.5 percent was used for livestock feed, 30.8 percent was utilized for ethanol, and 9.2 percent was processed into dried distillers grains (DDGs).[10] According to the U.N Food and Agriculture Organization, DDGs have become the most popular alternative ingredient used in beef, dairy, swine and poultry diets in the United States and in over 50 countries worldwide due to the "abundant supply, excellent feed value and low cost relative to maize and soybean meal."[11] As a result of larger annual corn harvests and the growing production of animal feed co-products, increased ethanol production has not affected availability of corn for traditional users.

This spring I will be planting my next corn crop that will be marketed in 2015. Until now, the RFS provided some certainty that there will be a growing commodity market. Based on USDA

[9] USDA (April 2013). World Agricultural Supply and Demand Estimates.
[10] USDA, ERS Feed Outlook, Jan 15, 2013.
[11] U.N. Food & Agriculture Organization (2012). Biofuel Co-products as Livestock Feed. Makkar, H. (Ed.). Rome, Italy: FAO Press.

commodity costs and returns, in 2012 it cost $655 per acre to plan corn. While costs have risen, that would require farmers to receive $4.25 a bushel to simply cover costs at this year's end. On Monday, the cost of corn was $4.17—$0.08/bushel below the cost of production. This recent decline in the price of corn is the largest drop in prices in six decades. Combined with increased input costs and lower crop prices, it will no longer be viable for farmers to continue to provide the resources they do. If the RFS is revised downward, as indicated by the EPA's proposed rule, rural communities and domestic energy sources will be left to wonder what might happen next. That uncertainty erodes confidence, undermines potential investment and generally stifles the robust growth we have seen in America's heartland.

FOOD PRICES AND FOOD SECURITY

There is no credible evidence to support the notion that the RFS has adversely affected consumer food prices. The RFS has little direct impact on agricultural commodity prices; because the farm value of commodities represents such a small share of retail food prices, the impact of the RFS itself on food prices is indiscernible. That said, higher energy prices as a result of increased petroleum costs play a much larger role in consumer food prices. In 2013, the World Bank found that nearly two-third of the increase in food prices since 2004 are the result of the increased price of crude oil.

According to the USDA, across all commodities, the farm share of the food dollar is 15.5 cents for 2011. This is below the average of 16.1 cents per dollar for the time period 1993-2011. Because the farmer is getting such a small percentage of the food dollar, commodity prices alone or some other single factor like the RFS cannot and should not be blamed for food price inflation.[12]

Commodity prices, not just corn, have increased since the mid-2000s. These price increases are a result of several factors—increased corn demand for fuel ethanol being only one of those factors. For commodity producers, this increase has not been all profit. In fact, cost of production has increased as a result of higher energy costs, which has significantly impacted a producer's break-even point. At the beginning of the last decade, corn producers where facing significantly depressed prices averaging $2 per bushel. Through the 2002 farm bill, Congress responded to this economic disaster in rural America to help commodity producers survive tough times. At the same time, livestock producers benefited considerably from these significantly below market prices. However, the prices received for livestock products were considerably lower during this period as well. As commodity prices have rebounded in the last five years, the Federal Government has seen significant savings in the commodity title of the farm bill. Livestock producers, like grain farmers, are "price takers" in that they sell a commodity and have to accept a market price. Meaning no single producer is large enough to move the market, nor are they able to pass increased costs of production onto the next player in the marketing chain. Meat production has expanded in almost every sector since the passage of the RFS. Fortunately for livestock producers, during this same period of increased feedstuff costs, the U.S. has been expanding export markets for meat products. Increased exports have driven up the cost of meat and livestock and thereby covered much of the higher costs of production.

While the cost of production, partially due to higher feedstuff costs, has risen, a more likely explanation of the increased food costs are factors outside of agriculture. Specifically, rising

[12] http://www.ers.usda.gov/data-products/food-dollar-series/food-dollar-application.aspx.

diesel fuel and labor costs have greatly impacted food prices. All food sold in a grocery store is delivered by truck. In 2007, the average price of a gallon of diesel fuel was $2.88; by 2012 that had increased to $3.97, a 37.8 percent increase. Likewise, while U.S. labor wages may have stagnated due to the on-going recession, other labor costs, most notably health care has not. Unlike farmers, meat packers, wholesalers and food retailers are not "price takers" and increased costs of production can more easily be passed onto consumers. As the USDA data cited above indicates, the vast majority of the retail food dollar arises after products leave the farm.

The lack of any perceptible relationship between the RFS and retail food prices is further illustrated by the fact that the average American household spends less of its disposable income on food today than it did prior to the existence of the ethanol industry and the RFS. Since enactment of the RFS2 in 2007, Americans have spent an average of just 9.7 percent of their income on food.[13] In the 10 years prior to adoption of the RFS2, spending on food accounted for 10 percent of disposable income. Spending on food, as a share of income, has trended down steadily since the 1940s and the emergence of ethanol and passage of the RFS have in no way interrupted this trend.

CONCLUSION

In conclusion, NCGA appreciates the Committee and Subcommittee's interest in better understanding the market dynamics surrounding the RFS. We strongly believe the RFS is doing exactly what it was intended to do. It is successfully driving adoption of renewable fuel alternatives to petroleum while decreasing GHG emissions, supporting jobs across the country and ensuring the United States remains a global leader in developing new energy sources here at home. Corn growers will continue to meet the growing demands in an economical and environmentally responsible manner.

###

[13] USDA-ERS (2013). Food Expenditures. http://www.ers.usda.gov/data-products/food-expenditures.aspx

March 19, 2014

Honorable Barbara Boxer, Chairman
Honorable David Vitter, Ranking Member
Committee on Environment and Public Works
410 Dirksen Senate Office Building
Washington, D.C. 20510

Dear Chairman Boxer and Ranking Member Vitter:

Thank you for inviting me to testify in the joint full Committee on Environment and Public Works and Subcommittee on Clean Air and Nuclear Safety hearing entitled "Oversight Hearing on Domestic Renewable Fuels." The hearing allowed me the opportunity to represent the National Corn Growers Association (NCGA) and provide our favorable perspective of the Renewable Fuel Standard (RFS).

It was requested that we submit an answer to Senator Vitter's question:
Assuming EPA's waiver methodology is in place annually, if you had your choice between status quo or making reforms to the program, which would you choose?

The RFS is working—achieving the goals Congress intended—and does not need any legislative changes. As written, the statue provides the Environmental Protection Agency (EPA) with flexibility to monitor and amend the program when necessary. Under their authority, the EPA can only waive gallon requirements if it finds:

- that the RFS would cause "severe economic harm" to the economy or the environment; or
- there is an inadequate domestic supply.

With these waiver requirements in place, the RFS already has the ability to continue to utilize renewable resources in our fuel supply.

The RFS is a critical component of our nation's energy policy. The RFS has increased national energy security by creating a market for renewable fuel as a substitute for non-renewable petroleum-based fuel, thereby accelerating the nation's progress toward a low greenhouse gas (GHG) emissions economy. Corn farmers have played a critical role in the RFS by producing the feedstock for ethanol production and will continue to meet the increased demand of corn for ethanol.

Sincerely,

Jon Holzfaster
Owner and Operator, Holzfaster Farm

Senator BOXER. Thank you. Our next witness is Mr. Scott Faber of the Environmental Working Group. Welcome.

STATEMENT OF SCOTT FABER, SENIOR VICE PRESIDENT FOR GOVERNMENT AFFAIRS, ENVIRONMENTAL WORKING GROUP

Mr. FABER. Thank you. Chairman Boxer, Ranking Member Vitter, members of the Committee, thank you very much for the opportunity to testify. I do not envy your job after reading all of the written testimony and many of the footnotes and supplemental reports. It would be hard to be able to judge whether the RFS is working or not.

Our view is that we need an RFS. We share your belief that RFS is critically important to reduce the carbon intensity of our liquid fuels but that the current RFS is not working as you intended when Congress passed the Energy Independence and Security Act of 2007.

In particular, we believe that RFS is not providing a powerful enough incentive for the development of low carbon second generation biofuels to offset the negative impacts of conventional biofuels like corn ethanol. And the simple fact of the matter is that the surge in corn ethanol production that occurred after 2007 has encouraged farmers to plow up millions of acres of wetlands and grasslands, releasing carbon stored in the soil into the atmosphere.

But that is not all. Because farmers have applied more fertilizer to these newly converted lands, the RFS has also increased nitrous oxide emissions, increased polluted runoff into our rivers, lakes and bays, increased water use and increased the emissions of air pollutants like particulate matter.

I expect the environmental impacts of corn ethanol will continue to be subject to debate for many years. For what it is worth, the National Academy of Sciences looked at these questions and the NAS, relying on EPA's analysis, concluded, and I quote, corn grain ethanol produced in 2011 is a higher emitter of GHG than gasoline and the increase in corn production has contributed to environmental and surface effects on surface and groundwater. And finally, and again I quote, projected air quality effects from ethanol fuel would be more damaging to human health than those from gasoline use.

And while the corn ethanol mandate has been great for corn farmers, and times have not always been great for corn farmers, it has contributed to higher food and feed prices. By diverting more than 40 percent of our corn crop to displace just 7 percent of our gasoline, we have increased the price of food and feed. That is according to everyone from USDA to the World Bank to independent economists. They found that the rapid expansion of corn ethanol after passage of the 2007 law increased the price of corn and ultimately the cost of basic staples like milk and meat.

Fortunately, some second generation biofuels hold real promise because, as you have heard today, many of these fuels convert crop waste, wood waste, even municipal solid waste, not food, into fuel. Unfortunately, as you have also heard today, AAA, automakers, engine manufacturers and this morning the EPA have repeatedly told us that the vast majority of engines and infrastructure are simply not yet compatible with higher-ethanol blends.

So, there is a real world limit on the amount of ethanol that can be blended into gasoline. We need to divert more of that limited pool to second generation biofuels, and EPA's proposed RVO takes an important small first step in that direction.

There are other steps that we can take to accelerate the development of low carbon second generation biofuels. At a minimum, EPA could level the playing field for these fuels by making all corn ethanol subject to the same greenhouse gas reduction standards. Right now, as you know, most corn ethanol production is simply exempt from any greenhouse gas reduction standards. By contrast, second generation biofuels must reduce GHG emissions by 50 or 60 percent.

There are other steps we could take as well, especially to accelerate the development of drop-in biofuels that do not create the infrastructure and engine compatibility problems that we have heard about today.

So, let me stop there and simply say, again, we support RFS, we believe it is important to have an RFS to drive the development of low carbon liquid biofuels but that RFS is not providing a strong enough incentive to develop the second generation fuels that I know we all would like to see in the marketplace.

Thank you.

[The prepared statement of Mr. Faber follows:]

ENVIRONMENTAL WORKING GROUP www.ewg.org

Testimony of Scott Faber

Senior Vice President for Government Affairs
Environmental Working Group

Before the

Subcommittee on Clean Air and Nuclear Safety

and the

Senate Committee on Environment and Public Works

Domestic Renewable Fuels

December 11, 2013

Thank you for the opportunity to testify. My name is Scott Faber and I am the Senior Vice President for Government Affairs at EWG.

EWG applauds the Senate Committee on Environment and Public Works and the Subcommittee on Clean Air and Nuclear Safety for reviewing the Renewable Fuel Standard.

To date, the RFS has failed to deliver the "good" biofuels that could help meet many of our environmental and energy challenges. Instead, the RFS has delivered too many "bad" biofuels that increase greenhouse gas emissions, pollute air and water, destroy critical habitat for wildlife and drive up the price of food. The corn ethanol mandate of the RFS, once promoted as a tool to combat climate change, has instead raised greenhouse emissions, exacerbated air and water pollution challenges and inflated the price of staple foods.

Since it was expanded in 2007, the corn ethanol mandate has contributed to plowing up more than 23 million acres of US wetlands and grasslands in order to plant crops – an area the size of Indiana. EWG recently analyzed the annually updated satellite data that the US Department of Agriculture uses to track land use and documented this rapid destruction of wetlands and grasslands.[1] In places where the loss of wetlands is most extensive, corn accounts for the largest share of this conversion.[2] Other studies have also

[1] EWG, (2012) Plowed Under. http://static.ewg.org/pdf/plowed_under.pdf.
[2] EWG, (2013) Going Going Gone. http://static.ewg.org/pdf/going_gone_cropland_hotspots_final.pdf

documented this dramatic change to the American landscape.[3] By accelerating conversion of wetlands and grasslands to grow crops, the RFS has driven up greenhouse gas emissions by releasing carbon stored in the soil[4] and by boosting fertilizer applications.[5]

The Environmental Protection Agency's own analysis has shown that lifecycle greenhouse gas emissions of corn ethanol were higher than those of gasoline last year (2012) and will still be higher in 2017.[6] Of the 33 identified corn ethanol production pathways, only three decreased emissions in 2012 and only nine are expected to meet the greenhouse gas reduction standard for corn ethanol in 2017.[7]

What's more, new research suggests that the RFS will not achieve long-term greenhouse gas reductions. Researchers calculated that the cumulative greenhouse gas emissions caused by corn ethanol between 2010 and 2044 will be about 1.4 billion tons –300 million tons more than from an energy-equivalent amount of gasoline.[8] That means the cumulative lifecycle greenhouse gas emissions from corn ethanol would be 28 percent higher than those from gasoline.

These studies contradict earlier research – based on hypothetical corn ethanol production in 2022 – that suggested that the 30-year lifecycle greenhouse gas emissions from corn ethanol would be lower than those from an energy-equivalent amount of gasoline.[9] EPA presumed investments and technological upgrades, such as fuel switching, that are speculative at best, since most corn ethanol is not subject to the greenhouse gas reduction standards of the RFS.

In addition to increasing greenhouse gas emissions, corn ethanol also drives up emissions of many other air pollutants, including sulfur dioxide, particulate matter, ammonia, nitrogen oxides and ozone.[10] In 2011, the National Academy of Sciences found that "overall production and use of ethanol was projected to result in increases in the pollutant concentration . . . Those projected air-quality effects from ethanol fuel would be more

---

[3] E.g. Wright and Wimberly (2012), *Recent Land Use Change in the Western Corn Belt threatens Grasslands and Wetlands.*

[4] Clearing forest, pasture or wetland for new cropland to produce biofuels results in decomposition of organic carbon and elevated GHG emissions, creating a "carbon debt" which may take many years for biofuel consumption to "pay down." See EPA (2011), *Biofuels and the Environment: Triennial Report to Congress*, at 5-9.

[5] Fertilizer applications increase emissions of nitrous oxide, a far more potent greenhouse gas than carbon dioxide. In 2011, nitrous oxide accounted for about 5% of all US GHG emissions, and nitrous oxide molecules stay in the atmosphere for an average of 120 years.
See EPA: http://epa.gov/climatechange/ghgemissions/gases/n2o.html.

[6] See Docket No. EPA-HQ-OAR-2005-0161-3173.5

[7] *Id.*

[8] Clean Air Task Force (2013), Corn Ethanol GHG Emissions Under Various RFS Implementation Scenarios, included in CATF Comments on EPA RFS 2013 Volume Adjustment. [Hereinafter CATF]

[9] CATF at 3.

[10] Wagstrom and Hill (2011), *Air Pollution Impacts of Biofuels* [Hereinafter Wagstrom]; *See also* Gasparatos and Stromberg (2012), Socioeconomic and Environmental Impacts of Biofuels: Evidence from Developing Nations, Cambridge University Press, England.

damaging to human health that those from gasoline use."[11] In particular, experts have found that, compared to the lifecycle emissions from gasoline, corn ethanol results in significantly greater emissions of particulate matter, which can contribute to respiratory illnesses and heart disease.[12] As a result, the corn ethanol mandate is complicating state and local efforts to meet pollution standards for particulate matter. Additionally, EPA concluded that the 2007 expansion of the RFS will also raise ozone levels.[13] Overall, the increase in emissions caused by the RFS are, according to the National Academy, "projected to lead to increases in population-weighted annual average ambient [particulate matter] and ozone concentrations, which in turn are anticipated to lead to up to 245 cases of adult premature mortality."[14]

Corn ethanol also contributes to significant water quality and quantity challenges. As the number of acres dedicated to corn production has increased – from an average of 79 million acres between 2000 and 2006 to 90 million acres, on average, between 2007 and 2012 – farmers have applied far more nitrogen fertilizer.[15] Nitrogen that washes off farm fields contributes to poor water quality, increasing water treatment costs and creating low-oxygen "dead zones." As the National Academy noted, "the increase in corn production has contributed to environmental and surface effects on surface and ground water, including hypoxia, harmful algal blooms and eutrophication."[16] Water used to irrigate corn and to operate ethanol refineries also depletes aquifers and streams. According to various studies compiled by the Academy, on a well-to-wheel basis producing a gallon of gasoline consumes far less water than producing a gallon of corn ethanol.[17]

Fortunately, some second-generation biofuels hold far more promise than corn ethanol.[18] Produced from crop wastes or other byproducts, some of these fuels do not contribute to the conversion of land or increase the use of farm chemicals.[19] Because greenhouse gas emissions from transportation account for 28 percent of GHG emissions – the second largest source – low-carbon biofuels must be part of any strategy to reduce the carbon intensity of liquid fuels.[20]

---

[11] National Academy of Sciences (2011), *Renewable Fuel Standard: Potential Economic and Environmental Effects of US Biofuels Policy*, at 246. [Hereinafter NAS].
[12] Tessum, et al. (2012), *A Spatially and Temporally Explicit Life Cycle Inventory of Air Pollutants from Gasoline and Ethanol in the United States; See also* Cook, et al., (2010) *Air Quality Impacts of Increased Use of Ethanol under the United States' Energy Independence and Security Act; See also* Wagstrom
[13] Environmental Protection Agency, Renewable Fuel Standard Program (RFS 2) Regulatory Impact Analysis (2010) at 602.
[14] NAS at 206.
[15] Testimony of Joseph Glauber, Chief Economist, USDA, before the Subcommittee on Energy and Power of the House Committee on Energy and Commerce, June 26, 2013. [Hereinafter Glabuer] Corn acres reached 97.2 million acres in 2012.
[16] NAS at 10.
[17] *Id.* at 227.
[18] Some second-generation biofuels are reaching the marketplace, including biofuels derived from grasses, wood waste, crop wastes (such as corn stover and corn cobs) and municipal solid waste.
[19] Tilman, et al. (2009), *Beneficial Biofuels – The Food, Energy, and Environmental Trilemma; See also* Wagstrom and Hill.
[20] http://www.epa.gov/climatechange/ghgemissions/sources/transportation.html.

Unfortunately, the marketplace is saturated by corn ethanol, blocking the commercial development of promising second-generation fuels. While corn ethanol refiners currently have the capacity to produce more than 14.9 billion gallons, gasoline refiners can only blend 13.3 billion gallons of ethanol into the fuel supply. This is commonly known as the "blend wall."[21] Expected declines in fuel consumption, driven largely by fuel efficiency standards, will further reduce the amount of ethanol that can be blended into gasoline.

To allow second-generation biofuels to gain a foothold, Congress must reform the RFS to reduce the prominence of corn ethanol and to accelerate the development of "drop-in" fuels that are compatible with existing engines and infrastructure. At a minimum, Congress should "level the playing field" by demanding that all ethanol production meet the same high greenhouse gas reduction standards. Accelerating development of promising second-generation fuels, especially drop-in fuels, is critical to reducing the carbon intensity of the overall fuel supply, but this is not happening quickly enough to offset the negative environmental impacts of conventional biofuels. To date, the RFS, as currently designed, is not providing sufficiently powerful incentives to develop these second-generation fuels.[22]

Accelerating the development of second-generation fuels could also reduce price and volatility of commodity prices. Between 2005 and 2012, annual corn ethanol production grew from less than 4 billion gallons to almost 14 billion. As a result, the share of corn diverted from food and feed supplies rose from 14 percent to more than 40 percent.[23] Expanding corn production has only partially offset the rapid growth in demand for corn ethanol, resulting in significantly higher corn prices for feed. Although many factors have contributed to price increases, experts estimate that corn ethanol accounted for more than one-third of the surge in corn prices from 2006 to 2009.[24] Other economists have estimated that average corn prices were 30 percent greater between 2006 and 2010 than they would have been had corn ethanol production remained at 2005 levels.[25]

Higher corn prices hurt consumers – especially low-income consumers who spend a larger share of their disposable income on food – by increasing the cost of basic staples. When the price of a bushel of corn increases by $1, the price of eggs increases by 5.5 percent, and the price of milk increases by 2.1 percent.[26] The surge in ethanol use accounted for as much as 15 percent of the rise in domestic food prices between April

---

[21] "Corn Ethanol Challenged." *Living on Earth* Interview with Wallace Tyner, Purdue University, February 2013.

[22] The Energy Information Administration has repeatedly reduced its predictions for cellulosic biofuel production by 2022: from less than 3 billion in 2012, to less than 1 billion gallons in January 2013, to less than 500 million gallon in April 2013.

[23] World Agricultural Outlook Board, USDA, World Agricultural Supply and Demand Estimates (2013).

[24] Babcock and Fabiosa (2011) *the Impact of Ethanol and Ethanol Subsidies on Corn Prices: Revisiting History*. CARD, Iowa State University.

[25] Carter (2012). *The Effects of the US Ethanol Mandate on Corn Prices.* [Hereinafter Carter]

[25] National Research Council, *op. cit.*, p. 147.

[26] Hayes (2009). *Biofuels: Potential Production Capacity, Effects on Grain and Livestock Sectors, and Implications for Food Prices and Consumers.*

2007 and April 2008.[27] The Congressional Budget Office found that the growth in ethanol production "has exerted upward pressure on the price of corn, and ultimately, on the retail price of food, affecting both individual consumers and federal expenditures on nutritional support programs."[28] In one year, ethanol production drove up federal spending on nutrition programs by up to $900 million, CBO reported.[29]

Although corn farmers benefit from higher corn prices, higher feed costs harm livestock producers and meat processors. The cost of corn for use in food production has increased by 193 percent since 2005.[30] For poultry producers alone, average annual feed costs have increased by $8.8 billion.[31] Rising demand for corn also drives up the price of wheat and other crops.[32] As wheat supply decreased in 2012, its price increased by approximately 50 percent.[33] These increases in the cost of basic commodities are inevitably passed on to consumers in the former of higher retail prices.

Blending more ethanol into gasoline may also harm many vehicle engines. According to AAA, more than 90 percent of the vehicles on the road today, including most 2001-2013 models, are not approved to use gas containing 15 percent ethanol, or E15.[34] Ford, Chrysler, Toyota and other automakers have explicitly warned consumers that filling up with E15 will void their vehicle warranties, and some companies have already placed warning labels on gas caps and instructions in owners' manuals not to use it.[35] In response to a 2011 congressional inquiry, vehicle manufacturers were nearly unanimous in voicing concern that E15 will cause engine damage, void warranties and reduce fuel efficiency.[36] AAA has also said that engine testing by the Department of Energy was not structured to measure E15's impacts on reduced engine life and fuel pump failure. The Association expects it will take another decade before the bulk of the U.S. vehicle fleet will be E15 compatible.[37] Meanwhile, many consumers are unaware that higher ethanol blends may harm their engines. A recent poll by AAA found that 95 percent of those surveyed had not heard of E15, prompting the nation's largest auto club to call for suspending all sales of E15.[38]

---

[27] Congressional Budget Office (2009). *The Impact of Ethanol Use on Food Prices and Greenhouse-Gas Emissions.*
[28] *Id.* at iii.
[29] *Id.* at vii.
[30] Govenor of Arkansas Mike Beebe in a letter to EPA Administrator Jackson, August 13, 2012.
[31] Testimony of Mike Brown, President, National Chicken Council, before the EPA public hearing for the 2014 Standards for the Renewable Fuel Standard Program, December 5, 2013. Rising costs have forced the turkey industry to shed 750 jobs in 2013.
[32] Griffen and Soto (2012). *US Ethanol Policy: The Unintended Consequences*
[33] American Bakers Association in response to the House Committee on Energy and Commerce White Paper on Agricultural Sector Impacts, April 29, 2013.
[34] AAA, "Statement by Bob Darbelnet, President and CEO of AAA." November 2013.
[35] "E15 gas brings conflict to pumps." *Star Tribune*. April 2012; *See also* the National Marine Manufacturers Association [Hereinafter NMMA]: http://multibriefs.com/briefs/nmma/E15.pdf
[36] See automakers responses to Rep. Sensenbrenner here:
http://sensenbrenner.house.gov/uploadedfiles/e15_auto_responses.pdf
[37] Testimony of Robert L. Darbelnet, President and CEO, AAA, before the Subcommittee on Energy and Power of the House Committee on Energy and Commerce, July 23, 2013.
[38] AAA. "New E15 Gasoline May Damage Vehicles and Cause Consumer Confusion." November 2012.

In addition, use of higher ethanol blends may damage many boat engines. None of the 17 million boat engines currently in commerce were designed, calibrated or certified to be compatible with any gasoline fuel containing more than 10 percent ethanol.[39] EPA has not permitted the sale and use of E15 for boats, but 95 percent of all recreational boats use fuel purchased at traditional gas stations, increasing the risk of misfueling.[40] The U.S. Coast Guard has warned that increasing the ethanol content in gasoline would exacerbate the risk of fires and explosions in vessels and pose safety issues for boaters who operate in harsh environments, sometimes miles from shore.[41] These concerns were echoed in a 2011 report to Congress in which the Coast Guard concluded that studies of ethanol's effects on marine engines raise environmental, performance and safety issues that have yet to be resolved.[42]

Small engine manufacturers are also concerned about the impact of higher ethanol blends. According to extensive testing by manufacturers and DOE, the use of higher ethanol blends on small non-road engines lowers engine life, reduces fuel economy and may cause the engine to fail emissions requirements.[43] Most small engines tested on E15 performed worse and ran higher operating temperatures, which increase wear and tear, and with it, the need for frequent maintenance.[44] Moreover, most tested engines behaved "poorly" or "erratically," according to DOE's report, with incidents of unstable speeds and stalling.[45]

Finally, most fuel dispensing and storage equipment is incompatible with E15 and would not comply with federal safety standards, according to the Government Accountability Office.[46] Compatible dispensers can cost upwards of $20,000, while replacing an underground storage tank can easily exceed $100,000 per location.[47] These are significant costs for retailers in order to sell a fuel for which demand is uncertain.[48]

Even as corn ethanol has increased environmental and consumer costs, it has done little to enhance American energy security. Gasoline consumption continues to decline as a result of tougher vehicle fuel economy standards, slower economic growth and higher fuel prices – not increased ethanol use.[49] Lower gasoline demand, in combination with increases in domestic production, are primarily responsible for recent and projected

---

[39] *Id.*
[40] See NMMA: http://capwiz.com/nmma/issues/alert/?alertid=62685606
[41] Rear Admiral Kevin S. Cook in a letter to EPA's Office of Air & Radiation, July 2, 2009.
[42] USCG (2012). *Survey of Published Data and Reports on Blended Fuels in Marine Applications*
[43] Testimony of Todd Teske, President, Chairman & CEO, Briggs & Stratton Corporation, before the Subcommittee on Energy and Power Committee of the House Committee on Energy and Commerce, July 19, 2013.
[44] *Id. at 4*
[45] *Id.*
[46] GAO (2011) *Challenges to the Transportation, Sale and Use of Intermediate Ethanol Blends.*
[47] Testimony of Joseph H. Petrowski, CEO, The Cumberland Gulf Group before the Subcommittee on Energy and Power of the House Committee on Energy and Commerce, July 23, 2013
[48] *Id.*
[49] Testimony of Adam Sieminski, Administrator, EIA, before the Subcommittee on Energy and Power Committee of the House Committee on Energy and Commerce, June 26, 2013.

reductions in foreign energy imports.[50] Strengthening U.S. energy security by expanding corn ethanol production is simply not feasible because of the amount of corn required to displace a significant amount of gasoline.[51]

In conclusion, the rapid expansion of corn ethanol production has increased greenhouse gas emissions, worsened air and water pollution, driven up the price of food and feed and may damage many engines. By contrast, some second-generation biofuels could significantly reduce greenhouse gas emissions without creating new environmental challenges, increasing food prices or requiring costly engine and infrastructure improvements. So long as corn ethanol saturates the marketplace for ethanol, the incentive to develop these promising new fuels will be limited.

[50] *Id.* at 7-8.
[51] Carter at 5

Questions from Sen. Benjamin L. Cardin:

1.) Has corn ethanol done more harm than good for the environment and human health?

Without adequate development of second-generation biofuels that emit significantly less greenhouse gases and pose less of a risk to air and water quality than conventional corn ethanol, the bad will continue to outweigh the good. As outlined in Mr. Faber's testimony, the rapid expansion of corn ethanol production – driven largely by the Renewable Fuel Standard – has produced a host of environmental harms confirmed in analyses by the Environmental Protection Agency and the National Academy of Sciences. These harms include the conversion of wetlands and grasslands to intensive corn production, the pollution of waterways by fertilizers that wash off from fields, and the increase in concentrations of harmful air pollutants that contribute to respiratory illnesses and other health problems. Despite this, corn ethanol still enjoys an exemption from meeting the program's most minimal environmental standards and a mandate that essentially guarantees its dominance in the marketplace for the foreseeable future.

2.) What have you learned since 2007 that makes you think the RFS is not generating the environmental benefits once promised?

Since Congress expanded the RFS mandates in 2007, we've witnessed a dramatic increase in the demand for — and the production of — corn for ethanol that has undermined the program's goal of lessening the environmental footprint of the U.S. transportation seetor. EWG's analysis of cropland data from the U.S. Department of Agriculture found that between 2008 and 2011, the corn ethanol mandate has contributed to the loss of 23 million acres of environmentally sensitive land — an area the size of Indiana.[1] In places where the loss of wetlands is most extensive, including the wildlife-rich Prairie Pothole region of the Upper Midwest, corn accounts for the largest share of this conversion – more than 346,000 acres.[2] This conversion has wiped out habitat that sustains many species of migratory birds and other animals. What's more, scientists estimate that meeting the RFS mandates by 2022 would require an additional 30 million acres of cropland to be converted for feedstock use – a virtual guarantee that any supposed benefits from corn ethanol would be erased by the widespread impacts of this conversion.[3]

By releasing huge amounts of carbon stored in the soil and increasing the use of fertilizers that emit nitrous oxide, the rapid conversion of wetlands and grasslands has driven up greenhouse gas emissions. In fact, EPA's own lifecycle analysis found that greenhouse gas emissions of corn ethanol were higher than gasoline in 2012 and will remain higher in 2017.[4] According to the National Academy of Sciences in a 2011 report,
"Food-based biofuels such as corn-grain ethanol have not been conclusively shown to reduce GHG emissions and might actually increase them."[5]

---

[1] EWG (2012), Plowed Under. http://static.ewg.org/pdf/plowed_under.pdf
[2] EWG (2013), Going Going Gone. http://static.ewg.org/pdf/going_gone_cropland_hotspots_final.pdf
[3] Fargione (2010), Is Bioenergy for the birds? An evaluation of alternative future bioenergy landscapes, Proceedings of the National Academy of Sciences [Hereinafter Fargione]. *See also* Jordaan (2013), Regional Water Implications of Reducing Oil Imports with Liquid Transportation Fuel Alternatives in the United States, Environmental Science & Technology.
[4] See Docket No. EPA-HQ-OAR-2005-0161-3173.5
[5] National Academy of Sciences (2011), Renewable Fuel Standard: Potential Economic and Environmental Effects of US Biofuels Policy, at 223 [Hereinafter NAS].

The demand for corn ethanol has also led many farmers in the Midwest to switch from a corn – soy rotation to continuous corn. This shift in crop mix boosts fertilizer use, which increases greenhouse gas emissions and reduces water quality. And without wetlands or grasslands to filter farm runoff, fertilizers wash into streams. EWG found that farms in Iowa are losing soil up to 12 times faster than government estimates and that soil erosion and polluted runoff in the Corn Belt is far worse than assumed.[6] Aerial photos show many cornfields scarred by gullies that funnel sediment and fertilizers into streams that feed into the Mississippi River. According to the National Academy:

> The increase in corn production has contributed to environmental effects on surface and ground water, including hypoxia, harmful aglal blooms and eutrophication. Additional increases in corn production under RFS2 will likely have additional negative environmental effects.[7]

The production and transport of fertilizers and pesticides used in corn production, as well as the cultivation and harvesting of corn crop all require the burning of fossil fuels including diesel, gasoline and natural gas. Today, most ethanol refineries rely on cheap natural gas for power generation. Burning these fuels emits large amounts of air pollutants that include carbon monoxide, particulate matter, sulfur dioxide, nitrogen oxides, ammonia and a host of volatile organic compounds such as acetaldehyde, classified by the EPA as a "probable human carcinogen." These pollutants have a wide range of adverse impacts on human health including cancer, asthma, chronic bronchitis, cardiovascular disease, respiratory irritation and birth defects.

EWG's 2009 review of the potential health risks of ethanol found that emissions from higher blends such as E15 may likely worsen health problems from air pollution.[8] Higher fuel blends can degrade emission control systems and damage engines of older vehicles by causing catalyst burnouts, thereby increasing emissions of acetaldehyde, particulates, ground-level ozone and other toxic air pollutants.[9] According to the National Academy:

> Air quality modeling suggests that production and use of ethanol as fuel to displace gasoline is likely to increase such air pollutants as particulate matter, ozone and sulfur oxides. Published studies projected that overall production and use of ethanol will result in higher pollutant concentration for ozone and particulate matter than their gasoline counterparts on a national average.[10]

Simply put: the more we learn of corn ethanol's impacts on the environmental and human health, the more difficult it is to justify a renewable fuels policy that mandates its use.

---

[6] EWG (2011), Losing Ground. http://www.ewg.org/losingground/
[7] NAS at 11.
[8] EWG (2009), Ethanol-Gasoline Fuel Blends May Cause Human Health Risks and Engine Issues, http://www.ewg.org/sites/default/files/ethanol-gasoline-white-paper.pdf
[9] *Ibid*
[10] NAS at 9.

3.) In an industry dominated by corn ethanol, how can we level the playing field for second-generation biofuels that do not compete with our food needs?

EWG strongly supports a federal mandate that drives the development of low carbon biofuels that do not pit our energy and food security needs against the environment and public health. But as long as the RFS remains a de-facto mandate for corn ethanol, these low carbon second-generation biofuels will not have a viable market to compete. Any reform made to the program should de-emphasize corn ethanol, which will continue to be a valuable oxygenate with our without a federal mandate. Significantly reducing the corn ethanol mandate frees up space in the market for more promising "drop-in" fuels that do not carry the same environmental or infrastructure problems. At a minimum, Congress can level the playing field for second-generation biofuels that must meet higher environmental standards under law by ending the exemption that allows virtually all existing corn ethanol production to skirt the minimum greenhouse gas reduction requirement. Demanding that all ethanol production meet the same high greenhouse gas reduction standards would be a major step in reducing the carbon intensity of the overall fuel supply, and would encourage greater investment in technologies that do not compete with our food needs.

4.) Could you respond to concerns that opening the RFS will jeopardize the Clean Air Act?
a.) In your opinion, is this reason enough not to act to reform the program?

EWG is wary of such concerns, and would strongly oppose any effort to endanger the Clean Air Act protections under the guise of RFS reform. Bipartisan support for reform continues to strengthen, reflecting the broad array of stakeholders including food and fuel producers, dairy farmers, restaurant owners, small engine manufacturers, boaters, environmental and hunger relief organizations, taxpayer groups and others that have united to call for a reduction in the corn ethanol mandate and a long-term legislative strategy to address the program's flaws. This coalition is committed to fending off attacks on the Clean Air Act that would derail sincere efforts to enact sound renewable energy policy. The appetite in Congress to reopen the RFS is only growing; shying away from RFS reform only serves to build up pressure to address this issue in the future.

5.) Is it time to take another hard look at energy policy in light of the fact that so much has changed since 2007?

Congress expanded the RFS in 2007 to reverse climate change, reduce U.S. dependence on foreign oil and create jobs in rural America. These goals were predicted on the expectation that fuel demand would continue to increase for the foreseeable future, that second-generation biofuels would quickly assume a greater role in the transportation energy portfolio and that corn ethanol was a green, renewable and efficient fuel source.

Today's energy landscape, however, is vastly different from what policymakers had envisioned. Domestic motor gasoline use is on a downward trend – a result of higher fuel economy standards, slow economic growth and high gasoline prices. The Energy Information Administration now projects that gasoline consumption in 2014 will drop to about 133 billion gallons – 14 percent lower than previously estimated. [11] And although the industry has made great strides toward commercializing full-scale second-generation biofuels, production of cellulosic ethanol and other advanced alternatives has fallen

[11] Testimony of Adam Sieminski, Administrator, Energy Information Administration, U.S. Department of Energy, before the Subcommittee on Energy and Power of the House Committee on Energy and Commerce, June 26, 2013.

well short of required targets set in law. EIA now projects that only 0.5 of the 16-billion-gallon cellulosic ethanol mandate will be produced in 2022.[12] Meanwhile, the scale to which corn ethanol production has increased since 2007 has turned out to be disastrous for our environment, and has produced unintended consequences for consumers and across wide swaths of our economy.

In light of these realities, it is well past time to re-examine U.S. biofuels policy.

[12] Testimony of Charles Drevna, President, American Fuel & Petrochemical Manufacturers, before the Subcommittee on Energy and Power of the House Committee on Energy and Commerce, July 23, 2013.

Question from Senator David Vitter

1.) Assuming EPA's waiver methodology is in place annually, if you had your choice between status quo or making reform to the program, which would you choose?

Congress – not the Environmental Protection Agency – should determine the right path of the RFS. EPA has stated that it does not expect to issue a final rule for the 2014 RFS standards until this summer – far past the statutory deadline. Similarly, EPA published the final 2013 RFS standards more than eight months late. The status quo creates uncertainty for investors, fuel producers, refiners and consumers, and places significant burdens on EPA and the Administration. Updating the RFS to reduce the mandate for corn ethanol and subject it to the same environmental standards as other biofuels will provide a powerful signal to the market, reduce the regulatory burdens being placed on EPA, and produce greater environmental benefits than current policies. While EWG does not support repeal of the RFS, we believe that important reforms are needed to set the program on a realistic path, and that ultimately Congress is the appropriate body to make such changes.

Questions from Senator John Barrasso:

1.) In July of 2013, you testified before the House of Representatives that:

> **our ethanol policies will continue [to] raise the cost of basic staples for American consumers and increase the number of food-insecure people around the globe.**

In 2012, the Director-General of the U.N. Food and Agricultural Organization called on the Obama Administration to suspend the RFS. The Director-General indicated that suspending the RFS would help reduce global food prices.

On December 10, 2013, two global hunger organizations — Oxfam America and Action Aid — signed a letter calling for the repeal of the corn ethanol mandate. Your organization, and dozens of other organizations, including groups representing food producers, also signed this letter.

Would you explain in greater detail how the RFS increases food prices for (A) American families as well as (B) the world's poor?

A) The National Academy of Sciences synthesized the conclusions of eleven studies that examined the 2007 to 2008 food price spikes, finding that between 20 and 40 percent of the increase in commodity prices was attributable to expanded biofuels production.[13] The expansion of the corn ethanol market increased corn prices by 36% from 2000 to 2009.[14] Feed makes up such a high proportion of the costs of producing meat and dairy; therefore, these higher feed costs harm livestock producers and meat processors. After increasing the corn ethanol mandate in 2007, the Consumer Price Index for meat, poultry, fish and eggs accelerated by 79%.[15] The retail prices of beef rose by 11 percent and pork rose by 14 percent from 2008 to 2011.[16] These price increases were in response to reducing herd sizes when commodity prices spiked in 2008.[17] Corn price increases not only hurt American families, but they also have had dramatic effects on the world's poor.

B) A 2012 OECD-FAO Agricultural Outlook Report found that trends in food prices are particularly sensitive to biofuels mandates in developed countries.[18] Notably, the Obama administration's Council of Economic Advisers warns that increasing production of food-based fuels such as ethanol "not only increases the demand for agricultural feedstocks but may also make demand less elastic through such measures as biofuel blending requirements. As such, integration [of food and energy markets] can cause shocks in one market to be transmitted to another.[19] The corn ethanol mandate increases the sensitivity of prices to shocks, such as drought or pests, by as much as 50 percent.[20] Price spikes are felt especially hard in developing nations where up to three-quarters of per capita income is spent on food. Researchers estimate that from 2006 until 2010-2011, US ethanol expansion cost corn importing developing nations

---

[13] NAS at 132.
[14] EWG (2012), EWG Guide to Understanding Ethanol. http://www.ewg.org/research/ethanol-report-2012
[15] Elman, Thomas (2012), The RFS: Fuel and Food Prices, and the Need for Statutory Flexibility.
[16] NAS at 133.
[17] *Ibid*
[18] OECD-FAO (2012), OECD-FAO Agricultural Outlook 2012-20121, OECD Publishing and FAO.
[19] Council of Economic Advisors (2013), Economic Report of the President at 257.
http://www.whitehouse.gov/sites/default/files/docs/erp2013/ERP2013_Chapter_8.pdf
[20] Hertel (2010), cited in NAS at 136.

$6.6 billion in higher corn prices, and cost Mexico alone an additional $1.1 billion in corn import costs.[21] Oxfam calculates that biofuels policies have endangered the livelihoods of 100 million people and have dragged more than 30 million into poverty.[22]

2.) In July of 2013, you testified before the House of Representatives that:

> **full implementation of the RFS, including the development and use of second-generation biofuels, would…'substantially increase the portion of agricultural land needed for biofuel production'…and result in almost no change in greenhouse gas emissions.**

At that time, you also testified that:

> **some second-generation fuels do not contribute to the conversion of land or increase the use of farm chemicals.**

Finally, you testified before the Senate that:

> **some second-generation biofuels [do not] creat[e] new environmental challenges, increase[e] food prices or requi[e] costly engine and infrastructure improvements.**

Which second-generation biofuels do not pose similar economic and environmental threats as corn ethanol?

Corn ethanol production poses environmental and economic threats because it competes for land that would otherwise be used for food or feed production, and it increases the price of corn globally. Biofuels produced from crop and forest residues, and municipal solid wastes do not compete for land used for food production. However, producing 16 billion gallons of cellulosic ethanol as mandated by the RFS would require additional feed-stocks, especially considering some crop residues should be left on the field in order to maintain soil fertility. Therefore meeting the RFS by 2022 requires we incorporate additional crop lands or marginal lands for feedstock production. Biofuels produced from grasses (switchgrass and Miscanthus are of particular interest) could be produced from marginal lands or on the buffer strips of existing croplands. These cellulosic biofuels have the potential to sequester more carbon than corn ethanol, if they do not compete with croplands used for feed and food production.[23]

---

[21] ActionAid International USA (2012), Fueling the Food Crisis: The Cost to Developing Countries of US Corn Ethanol Expansion. http://www.ase.tufts.edu/gdae/Pubs/rp/ActionAid_Fueling_Food_Crisis.pdf
[22] Oxfam (2008), Another Inconvenient Truth: How Biofuel Policies are Deeping Poverty and Accelerating Climate Change.
[23] Fargione (2010). *See also* Hill et al (2009), Climate Change and Health Costs of Air Emissions from Biofuels and Gasoline, Proceedings of the National Academy of Sciences.

Question from Senator Roger F. Wicker:

1.) Mr. Faber, you referenced loss of native grasslands and wetland habitat in your testimony, and I understand that the Environmental Working Group has also issued a recent report on this subject. I gather that not only does this loss of habitat negatively impact upland birds but the loss of duck breeding habitat could have serious implications all the way down the flyway as far as my state, Mississippi. Could you expand further on this problem?

Much of the conversion of wetlands and grasslands occurring in the Midwest, including the Prairie Pothole Region, is critical breeding habitat for ducks in the Mississippi and Louisiana flyways. Millions of ducks and geese pass through the PPR, which has suffered significant losses or degradation since 1984.[24] In the Dakotas, more than 3.2 million acres of habitat were destroyed between 2008 and 2011.[25] Experts also estimate that 1.4 million small wetlands in the eastern Dakotas, which are especially important for breeding ducks, are at high risk of being drained.[26] If they were to dry up, the number of breeding ducks could decline by 37 percent, according to the predictions.[27]

EWG used modern mapping and geospatial technologies to analysis the alarming trend of land conversion in these areas. Our analysis revealed that from 2008 to 2012, 1.9 million acres of wetlands and nearby habitat went under the plow.[28] Even more troubling, the mapping shows that conversion of these fragile lands is concentrated in regions that are both ecologically important and highly vulnerable to degradation.[29]

These findings echo research by scientists at South Dakota State University, which concluded that 1.3 million acres of grassland in the Western Corn Belt had been converted to corn and soybean fields between 2006 and 2011.[30] Disturbingly, the authors pointed out that planting of row crops in what had been grassland was "concentrated in close proximity to wetlands, posing a threat to waterfowl breeding in the Prairie Pothole Region."[31] They concluded that the accelerating trend "represents a persistent shift in land use rather than short-term variability in crop rotation patterns."[32]

Conservationists have expressed their concerns that the corn ethanol mandate is driving the conversion of grasslands and acres enrolled in the Conservation Reserve Program to corn fields, encouraging erosion close to supported waterfowl nesting habitat and causing reductions in wildlife populations in areas where hunting is an economic driver for local communities.[33]

---

[24] Ducks Unlimited, Praire Pothole Region. http://www.ducks.org/conservation/prairie-pothole-region
[25] EWG (2012), Plowed Under at 10.
[26] *Ibid*
[27] *Ibid*
[28] EWG (2013), Going Going Gone.
[29] *Ibid*
[30] Wright and Wimberly (2013), Recent Land Use Change in the Western Corn Belt Threatens Grasslands and Wetlands, Proceedings of the National Academy of Sciences.
[31] *Ibid*
[32] *Ibid*
[33] Boone & Crockett Club, in a letter to the Senate Committee on Environment and Public Works, December 10, 2013. http://cdn.ewg.org/sites/default/files/u120/Boone %26 Crockett Club to EPW re RFS. 12.10.13.pdf

Senator BOXER. Thank you very much. And we complete with a majority witness, Mr. Brooke Coleman, Executive Director, Advanced Ethanol Coalition. Welcome.

STATEMENT OF BROOKE COLEMAN, EXECUTIVE DIRECTOR, ADVANCED ETHANOL COUNCIL

Mr. COLEMAN. Thank you. Good morning Chairwoman Boxer, Ranking Member Vitter and members of the Committee, my name is Brooke Coleman. I am the Executive Director of the Advanced Ethanol Council.

The Advanced Ethanol Council represents worldwide leaders in the effort to develop and commercialize the next generation of ethanol fuels. We were founded by corporate leaders to establish one voice for the advanced and cellulosic ethanol industry and we maintain a partnership with the Renewable Fuels Association.

I, too, have submitted voluminous written testimony like my colleagues have, but I want to make a couple of points in the time that I have.

First, the Federal Renewable Fuels Standard is basically an advanced biofuel development policy at this point. Ninety percent of the gallons left in the policy are advanced biofuel gallons. Critics want to make the policy all about corn ethanol because they think it puts them in the best position to succeed legislatively, politically and from a public relations perspective. But what is really at stake here is the emergence of a new low carbon industry via both standalone plants and bolt-on technologies at existing plants.

If this country is going to lead the world in innovation, create new jobs, further reduce dependence on foreign oil and mitigate climate change emissions, it must reject backward thinking and move forward. And the RFS does that.

Second, proposals to open up the RFS are the policy equivalent of exporting the advanced biofuel opportunity to other countries like Brazil and China. The United States is not going to make a $12 billion per month commitment to clean energy, like China has. The U.S. has not made a commitment to biofuel infrastructure and flex-fuel vehicles like Brazil has. What we have is the RFS, described by one of my members as the gold standard globally for advanced biofuel policy.

A recent report by Navigant Consulting in my home State of Massachusetts looked at the country ranking for advanced biofuel development and it found that the United States is No. 1 because of the RFS: "The United States is currently home to estimated 67 percent of global ventures in advanced biofuels, and the Renewable Fuels Standard will keep the U.S. at the epicenter of the market going forward."

Less than 6 years after the signing of RFS II by President Bush, and notwithstanding our 100-year recession, we now have plants in places like Vero Beach, Florida, and Columbus, Mississippi. We are finishing construction on a plant in Hugoton, Kansas, where at one point recently there were 100 construction workers and engineers, 1,000, I apologize, 1,000 construction workers and engineers in a town of 1,400.

Third, I would encourage the Committee to take a really hard look at the arguments being made against the RFS. There is an ex-

traordinary amount of misinformation flowing around this regulation, including in this room. We all know that the oil industry has enough money to make it seem like it is raining on a sunny day and that is what is going on right here. The RFS is increasing food prices, we have heard. But the Food Index for food prices over the last 8 to 10 years is going down, not up. We heard that high rent prices are a cost of compliance that will ultimately increase gas prices.

The oil industry has been here telling you that, until quarterly earnings calls reveal that companies like BP, ExxonMobil, Hess, Murphy, Marathon and Phillips 66 have all reported no significant costs and actually, in most cases, profit from the higher RIN prices that were being traded in 2013. That is because they receive the RIN for free when they buy a gallon of renewable fuel. You cannot have the same dollar be a cost and a profit. That is Economics 101.

Finally, a really important question is often overlooked. If not renewable fuel gallons, then what? It is not 2005 gasoline in the rule. It is unconventional oil coming in on the margin of the industry. If that is where we want to go as a policy, that is a more expensive product, it is a more carbon-intensive product, and it is a more ecologically damaging product.

Going forward, to close, it is absolutely critical for Congress to leave the RFS alone. Tens of billions of dollars have been invested with the expectation that Congress will not change the rules in the middle of the game. The program is disruptive, but it is disruptive by design with flexibility.

I would hope that the Committee will consider the idea that the program is getting all this attention not because it is broken, but because it is working.

[The prepared statement of Mr. Coleman follows:]

United States Senate Committee on Environment and Public Works

Oversight Hearing on Domestic Renewable Fuels

Testimony of:

Brooke Coleman
Executive Director, Advanced Ethanol Council

December 11, 2013

Good morning, Chairwoman Boxer, Ranking Member Vitter, and Members of the Committee. My name is Brooke Coleman and I am the Executive Director of the Advanced Ethanol Council (AEC).

The Advanced Ethanol Council represents worldwide leaders in the effort to develop and commercialize the next generation of ethanol fuels and products, ranging from cellulosic ethanol made from switchgrass, wood chips and agricultural waste to advanced ethanol made from sustainable energy crops, municipal solid waste and algae. Our members include those endeavoring to operate production facilities, those interested in augmenting conventional biofuel plants with "bolt on" or efficiency technologies, and those developing and deploying the technologies necessary to make advanced biofuel production a commercial reality.

This is an important and timely hearing, and we are honored to be here today to discuss renewable fuels and the emerging advanced biofuels industry.

It is probably safe to say that any assessment of the domestic renewable fuels industry begins and ends with the federal Renewable Fuel Standard (RFS). It is probably also safe to say that the RFS is a disruptive policy that has caught the attention of incumbent industries, the media, and a wide range of public advocacy groups. The underlying question seems to be: is the RFS garnering this much attention because it's not working, or because it's working exactly as designed?

1. **The RFS is working as designed**

The RFS is an aggressive but flexible program that requires obligated parties to blend increasing volumes of various types of renewable fuel over time. When RFS2 was passed in 2007, Congress divided the 36 billion gallon per year (by 2022) blending standard into two primary categories: conventional biofuels (15 billion gallons per year) and advanced biofuel (21 billion gallons per year). The conventional biofuel requirement increases to 15 bgy by 2015, then "flat lines" at this level through 2022. The advanced biofuel requirement started with 600 million gallons in 2009 and increases to 21 billion gallons annually in 2022.

The beauty of the RFS is its flexibility in the context of constantly changing global financial and energy markets. Contrary to claims made by representatives of the oil industry, the program is

not requiring obligated parties to do something they cannot do. The ethanol industry has produced more than enough fuel to meet the conventional standard, and administrative flexibility in the advanced pool has allowed these blending targets to be achieved through the use of biodiesel, cane ethanol and other types of advanced biofuel. While it is true that the cellulosic biofuels industry has not produced enough fuel to meet the cellulosic targets set forth by Congress in the Energy Independence and Security Act of 2007, the standards within the advanced biofuel pool are nested and administratively flexible. U.S. EPA has waived more than 98 percent of the cellulosic obligation to date while facilitating broader RFS compliance with other advanced biofuels.[1] The advanced biofuels industry also expects to provide sufficient volumes of biofuel in 2013 to meet the originally legislated RFS targets. Simply put, this is a tremendous accomplishment during very difficult economic times.

But as the RFS drives increasing quantities of renewable fuel into the marketplace, and forces incumbent industries to truly diversify their fuel portfolios, it is important to focus on how the program works at a more granular level. The key is to focus on the program's compliance protocol; or more specifically, how Renewable Identification Numbers (RINs) work to change market behavior. Individual obligated parties (usually refiners or importers) must blend a certain volume of renewable fuel per year based on their respective share of the total non-renewable gasoline and diesel market. Obligated parties have the option of complying with the RFS by blending actual liquid renewable fuel gallons or by buying RINs on the open market. One RIN is generated per gallon of renewable fuel at the point of production. RINs then enter the market (free of charge) attached to the gallon of renewable fuel at the point of sale, but can then be separated from the liquid gallon for sale on the open market.[2] Compliance is achieved by retiring the right number of RINs with U.S. EPA every year. Obligated parties have the flexibility to defer some of their compliance obligation from year to year, and retire RINs secured from prior years to demonstrate compliance with U.S. EPA. In essence, obligated gasoline and diesel fuel refiners and importers get a RIN for free when they purchase a gallon of renewable fuel, which they can then retire that year to demonstrate compliance, hold for future compliance, or sell for a profit on the open market.

One of the focal points of the oil industry's attempt to rationalize amendment or repeal of the RFS at the legislative level is the miscasting of recently increasing RIN prices relative to the so-called blend wall and gas prices. Some major oil companies are arguing that they cannot blend more renewable fuel because of the "blend wall;" that higher RIN prices reflect the need to buy RINs instead of gallons to meet the RFS; and, that higher RIN prices will ultimately result in higher gas prices during the economic recovery. This is a creative argument, but it is not true.

---

[1] The requirement for cellulosic biofuels constitutes 16 of the 21 billion gallon advanced requirement, but Congress gave U.S. EPA the administrative flexibility to adjust downward the target for cellulosic biofuels based on expected supply. In essence, this means that RFS2 is a 20 billion gallon per year standard with 16 billion gallons per year waivable "adder" for cellulosic biofuels that can be adjusted over time by U.S. EPA based on the forecasted emergence of the industry.

[2] See http://www.eia.gov/todayinenergy/detail.cfm?id=11511.

The RFS is actually well-engineered to address the so-called blend wall (and other types of oil industry intransigence) on its own and without consumer cost. That is, when an oil company refuses to blend more liquid biofuel, they can buy a RIN on the open market instead. If a significant number of oil companies refuse to blend liquid gallons and seek RINs on the open market, RIN trading and values will increase as a result of their affirmative non-compliance. Higher RIN prices then provide an extra incentive for other obligated parties to blend liquid renewable fuel gallons, because they acquire a valuable and saleable RIN free of charge with each gallon of renewable fuel purchased. In essence, higher RIN values reward good behavior and facilitate the objectives of the RFS.

Higher RIN prices are not costing consumers money for two primary reasons: (1) higher RIN values are largely incenting the increased use of a renewable fuel that is up to $1 cheaper than gasoline, which cut consumer spending by $700 billion to $2.6 trillion in 2013, according to an oil economist; and, (2) many oil companies are now on record on earnings calls attesting to the fact that they are the ones *profiting* from higher RIN values, because they get the RIN for free when they buy a gallon of renewable fuel and can sell it to other obligated parties.[3] In other words, obligated parties buy and sell RINs amongst themselves after receiving them for free. For this reason, oil industry claims about higher RIN prices increasing gas prices defy basic logic. And there is always the option to avoid buying RINs all together by simply blending more renewable fuel.

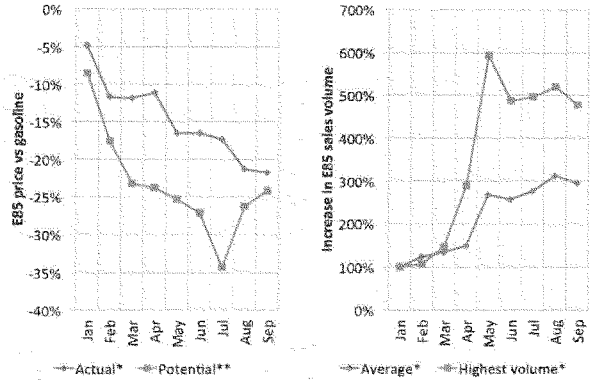
Oil industry claims that they cannot physically blend more renewable fuel also do not survive closer scrutiny. Obligated parties can blend more E15 (15% ethanol by content), E85 (85% ethanol by content), biodiesel (most engines are warrantied to handle higher biodiesel blends), and/ or more renewable diesel. With regard to E85, there were enough "flex-fuel" vehicles on the road in 2012 to consume 3 billion additional gallons of ethanol if, according to independent analysis, price per mile costs aligned with E10.[4] The chart below shows steeply increasing E85 sales in Minnesota during the spring, summer and fall of 2013 when RIN prices started to show value and E85 started to be priced below E10. This trend was occurring in many other states at the same time.

As discussed, E85 is not the only option for compliance going forward in the immediate term. E15 is now legal for 2001 and newer vehicles, which represents about two-thirds of the passenger vehicles on the road today. E15 is a premium, high octane fuel that, if priced correctly, would be cheaper than standard 87-octane blends. In discussing the interests of the oil industry relative to the RFS and the blend wall, oil industry economist Phil Verleger put it simply, "[t]he oil industry doesn't like to sell less oil ... [t]hey want to get the [RFS] program changed so that they can sell more gasoline and not have to use as much ethanol."[5] The battle for market access is critical to the emergence of the advanced biofuels because second generation biofuel developers need to be able to demonstrate

[3] For consumer savings, see: http://www.pkverlegerllc.com/assets/documents/130923_Commentary1.pdf. For summary of oil companies RIN profits, see: http://www.fuelsamerica.org/blog/entry/something-funny-about-those-oil-company-profits.
[4] See http://www.card.iastate.edu/publications/dbs/pdffiles/13pb15.pdf
[5] See: audio, http://www.zimmcomm.biz/rfa/rins-verleger.mp3

a reasonable expectation of market (i.e. demand) in order to secure project finance. As such, the solution to the blend wall is consistent and unwavering administration of the program, which in turn is both a long- and short-term solution to high gas prices. Softening the RFS in any way to address the blend wall will actually perpetuate the blend wall as a construct to dampen innovation and competition, which will cost consumers at the pump and undercut innovation in the sector.

Recent E85 sales data from MN (2013)



Source:
State of Minnesota; Presented by Butamax Advanced Biofuels. Senate Briefing, November 2013

2. **Advanced and cellulosic biofuels are breaking through at commercial scale notwithstanding very challenging financial markets**

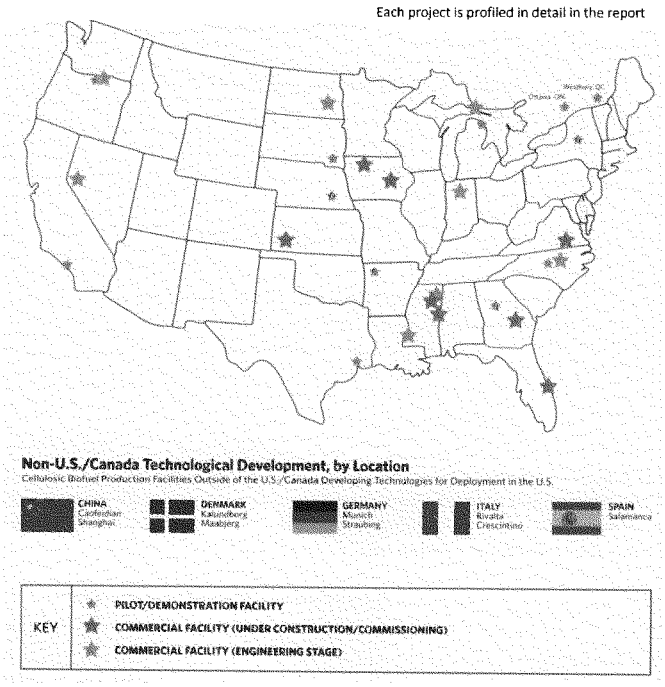
While the delta between the legislated targets and actual production for cellulosic biofuel is not a policy problem given the administrative flexibility built into the regulation, it has created optics issues for our industry and political opportunity for the oil industry. However, by any standard, the cellulosic biofuel industry is making tremendous progress.

As shown in the Progress Report recently released by the Advanced Ethanol Council (see U.S. Map below), the industry is breaking through at commercial scale less than six years after the enactment of RFS2 and notwithstanding the global recession.[6] And as noted by a recent assessment by U.S. EPA, the production cost of cellulosic biofuels continues to fall; the industry continues to make significant progress towards producing cellulosic biofuel at prices competitive with petroleum fuels; cellulosic biofuel producers faced not only the challenge of the scale-up of innovative, first-of-kind technology, "but also the challenge of securing funding in a difficult economy;" it is reasonable

[6] See AEC Progress Report: Cellulosic Biofuels at http://ethanolrfa.3cdn.net/96a2f9e04eb357bbbd_1sm6vadqk.pdf.

to expect production and capital costs to continue to decline as more facilities come online and the so-called "commercial learning curve" is achieved; and, first commercial projects in the pipeline for cellulosic biofuels have made great progress in securing the necessary feedstock for their plants.[7] These industrial benchmarks are also widely reported in a number of academic studies.[8] For example, an industry survey conducted by Bloomberg New Energy Finance concluded that "[t]he operating costs of the [cellulosic biofuel] process have dropped significantly since 2008 due to leaps forward in the technology [emphasis added]... [f]or example, the enzyme cost for a litre of cellulosic ethanol has come down 72% between 2008 and 2012."[9] Very simply, the best way to for Congress to facilitate the ongoing development of the advanced biofuels industry is to leave the RFS alone. The program will continue to work if policy uncertainty is kept to a minimum.

Locations of Projects Profiled by AEC Progress Report [10]



[7] See Docket ID No. EPA-HQ-OAR-2012-0546: Regulation of Fuels and Fuel Additives: 2013 Renewable Fuel Standards
[8] See: *Cellulosic Ethanol Heads for Cost-Competiveness by 2016, http://about.bnef.com/press-releases/cellulasic-ethanol-heads-for-cost-competitiveness-by-2016/*; Brown, T., Brown, R. "A review of cellulosic biofuel commercial-scale projects in the United States." Biofuels, Bioprod. Bioref. DOI:10.1002/bbb.1387 (2013).
[9] See http://about.bnef.com/press-releases/cellulosic-ethanol-heads-for-cost-competitiveness-by-2016/
[10] To view full AEC Progress report, see http://ethanolrfa.3cdn.net/96a2f9e04eb357bbbd_1sm6vadgk.pdf.

It is important to note that the projects being developed by the advanced and cellulosic biofuels industry are producing and will produce the lowest carbon liquid fuels in the world. Cellulosic ethanol, for example, is: (a) vastly more carbon reductive than its primary competitor on the margin of the petroleum industry (tar sands, heavy oil, tight oil); (b) vastly more carbon reductive than the baseline used to analyze the RFS – 2005 gasoline; and, (c) significantly more carbon reductive than technologies often regarded to be the most innovative (electric drive, hydrogen).

California Air Resources Board Carbon Intensity Comparison

Baseline: The carbon intensity of unconventional petroleum is ~ 105+ g/MJ
Note: Many waste to-ethanol fuels are carbon *reductive* (i.e. less than 0 g/MJ)

Fuel / Feedstock	Carbon Intensity (gCO2e/MJ)
Ethanol, conventional	95.66
Ethanol, CA corn	80.70; decreasing to 70.70 in 2016
Ethanol, Low CI Corn	73.21
Ethanol, Sugarcane	73.40; decreasing to 67.38 by 2020
Ethanol, Cellulosic	21.30 [a]
Renewable Gasoline	25.00 [b]
Compressed natural gas	68.00
Biogas, landfill	11.56
Electricity, marginal [c]	30.80; decreasing to 26.32 by 2020
Hydrogen [d]	39.42

[a] The average of CARB pathways for ethanol from farmed trees and forest ways
[b] Estimated carbon intensity based on stakeholder consultation.
[c] Includes the energy economy ratio (EER) of 3.4 for electric vehicles
[d] Includes the EER of 2.5 for fuel cell vehicles

Source: ICF International

3. **The U.S. government has always used federal policy to promote energy security and jobs and avoid the pitfalls of being dependent on other countries for energy supply; the RFS is a cost-effective and appropriate way to support the renewable fuels industry, especially in the context of substantial existing support for the fossil fuel industry**

The RFS does not exist in a vacuum. It was certainly designed and implemented to benefit the renewable fuels industry, but it exists over the top of a myriad of other government programs promoting the development of non-renewable fuels to facilitate economic development, energy security and/or job creation. While many of these policies lie outside of the jurisdiction of this committee, ongoing support for bioenergy from programs within the jurisdiction of this committee should not be analyzed with a mythical baseline in which supports for biofuels are in any way unique.

The fossil fuels industry, in particular, enjoys the benefit of a number of unique federal tax allowances – unavailable to renewable fuels – that de-risk the ongoing development of oil and gas resources relative to other sources of liquid fuel. For example, a recent study estimates that fossil fuels received 70 percent of U.S. federal energy subsidies between 2002 and 2008, to the tune of more than $70 billion during this time period. [11] This number does not include the loopholes in oil and gas laws that, according to the Government Accountability Office (GAO), allowed petroleum companies to forego paying $53 billion in royalty payments, over just four years, for extracting natural resources from lands owned by the American taxpayer. The federal government also helps incumbent industries develop new technologies. According to a recent Congressional Research Service report, [f]or the period from 1948 through 2012, 11.6% of Department of Energy R&D spending went to renewables, 9.7 % to efficiency, 25% to fossil energy, and 49.3% to nuclear.[12]

The RFS, by contrast, is a flexible blending requirement that costs the U.S. Treasury virtually nothing (either via direct payments or foregone revenue) but nonetheless has resulted in the development of an entirely new industry that creates jobs, reduces gas prices, lessens foreign oil dependence, mitigates climate change emissions from the liquid fuel sector, and provides an alternative to costly "high carbon" fuel sources like heavy oil, tight oil and tar sands.

Some oil industry trade associations have suggested that we no longer need the RFS because of recent successes in the Bakken and other tight oil reserves. As discussed below, this argument relies on a fantastical view of what lies beneath the ground in these tight oil formations and their potential to reorder influence in world oil markets. But from the perspective of government support, it is important to note that federal policy also unleashed these energy plays. In June 2012, the Senate Finance Committee received testimony from the largest leaseholder in the nation's largest oil play (the Bakken) about the importance of tax incentives for new energy production. Among other points, the CEO of Continental Resources stated:

> There is good reason that when the tax code was reformed in 1986, a bipartisan majority recognized the importance of leaving the tax provisions of the American independent oil and gas industry intact. This decision played a significant role in the technology-driven oil and gas renaissance we are currently experiencing.
>
> ... The development of horizontal drilling took trial and error. Without the current capital [federal tax] provisions in place, we would not have been able to fail over and over again [emphasis added], which is what it took to advance the technology needed to produce the Bakken and numerous other resource plays across America [emphasis added]. And this technology that allows us to drill two miles down, turn right, go another two miles and hit a target the size of a lapel pin is the technology that has unlocked the resources that make energy independence a reality.

[11] See http://www.elistore.org/Data/products/d19_07.pdf.
[12] See http://www.fas.org/sgp/crs/misc/RS22858.pdf

> This paradigm shift in American oil and gas exploration brings with it high-paying jobs, increased tax revenues, and economic growth, while lessening our dependence on foreign oil. But it depends on substantial amounts of capital. The tax provisions that let us keep our own money [emphasis added] to reinvest in drilling are crucial to keep this energy revival going.[13]

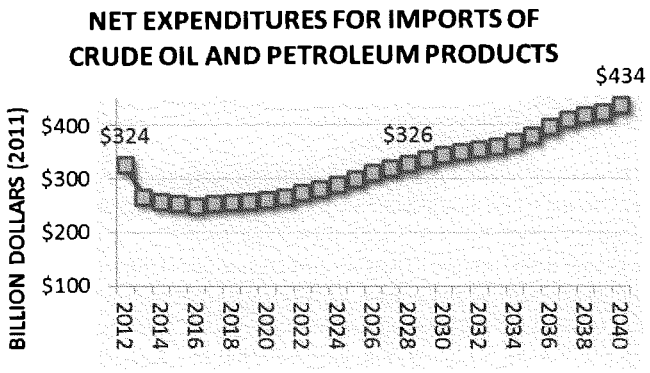
It is critical to point out that cellulosic biofuel producers and "tight oil" producers have something in common; they are both endeavoring to supply the country and world markets with what the Energy Information Administration (EIA) terms "unconventional fuel." While facing similar technology risk, the cellulosic biofuels industry does not receive the same tax treatment as companies like Continental Resources (from the perspective of value or duration).

4. **The idea that America no longer faces a serious oil dependence problem is myth, and weakening the RFS would make Americans and the U.S. economy more vulnerable to the clear risks of its ongoing over dependence on only one type of fuel**

Oil dependence is well-recognized as a serious threat to the economic well-being of the United States. In discussing the impact of high oil prices on the U.S. economic recovery, Central bank chairman Ben Bernanke recently stated that, "sustained rises in the prices of oil or other commodities would represent a threat both to economic growth and to overall price stability, particularly if they were to cause inflation expectations to become less well anchored."[14] Americans transferred nearly $1 trillion to OPEC member states during what was termed the oil price spike of 2008, in just 6-8 months. 2013 EIA forecasts suggest that trends above $100 per barrel are not a spike, but are instead a new equilibrium.[15]

The oil industry argues that recent discoveries of tight oil and technological breakthroughs for accessing these reserves change the equation when it comes to oil dependence. But the recent increase in domestic oil production does not mitigate the risks of oil dependence. First, while domestic oil production is up, the *consumer cost* (i.e. financial drain) of oil dependence is actually expected to increase. The increasing cost of oil dependence stems from multiple factors, including but not limited to: (1) the fact that the U.S. supplies only 8 percent of the world's oil and the "boom" in 2012 only increased U.S. output by 12 percent; (2) the fact that light sweet crude reserves appear to be in steep decline in the face of quickly increasing demand from countries like China and India; and, (3) the new types of unconventional oil coming online are expensive to extract.

[13] See http://www.finance.senate.gov/imo/media/doc/Hamm%20Testimony1.pdf, p. 2.
[14] See http://abcnews.go.com/blogs/politics/2011/03/bernanke-warns-rising-oil-prices-could-pose-threat-to-economy/
[15] See http://www.eia.gov/forecasts/steo/pdf/steo_full.pdf



Source: RFA, based on data from the U.S. Energy Information Administration

Second, current global reserves of petroleum-based unconventional fuel (heavy oil, tight oil, etc.) are not proven reserves. In other words, while these reserves have been discovered via advanced imaging, it is not clear that they can be recovered. An April 2013 article in *Science* states, "data on reserves of many unconventional sources are now regarded as optimistic, compounded by thermodynamic inefficiencies in the processes, often relying on high energy inputs, [that] will ultimately limit the net gain to provide fuel quantities well below predicted figures."[16] Historically, overstating the potential impact of new oil reserves is nothing new. The oil industry and its analysts have a long history of way overestimating the vastness of its claimed reserves (see attachment).

The uncertainty and risk surrounding the viability of unconventional oil reserves is compounded by the fact that there is virtually no transparency when it comes to "source data" for the myriad of claims about future oil markets made on an everyday basis by analysts in the sector. For example, Russia (one of the world's largest conventional oil producers) declared all oil data a state secret in 2004. Neither Saudi Arabia nor Venezuela share data publicly when they make claims about future capacity. OPEC members have the incentive to inflate reserves because quotas are based on reported reserves; the higher the reported reserve, the higher the quota relative to other members. There is also the challenge of attracting investment, from both government and outside sources. As discussed in the aforementioned article in *Science*, "there are political and financial pressures to misreport figures ... [and] there are fears that Saudi oil reserves (and others) may have been over-estimated by at least 40% ... [a]t best Saudi reserves are seen as near maturity," given that

[16] Chapman, I., *The end of Peak Oil? Why this topic is still relevant despite recent denials*, Energy Policy (2013). http://dx.doi.org/10.1016/j.enpol.2013.05.010.

7 million barrels of sea water are being injected in the main field on a daily basis to increase flow.[17] John Hofmeister, former President of Shell Oil, recently told CNBC that, "I think OPEC is about maxed out ... when people talk about spare capacity in OPEC, I don't see it. I just don't see it coming through and I'm not sure it's there. And it's not just that they're greedy, but they're really producing what they can produce."[18]

OPEC and the oil industry also have the incentive of exaggerating the size and accessibility of "new reserves" to weaken political and market interest in developing alternatives. OPEC first admitted its focus on alternative fuels in 2006, when it openly admitted that its price setting is designed partially to deter their use.[19] Likewise, the Bakken reserve is often used to support the thesis that the United States no longer needs the Renewable Fuel Standard (RFS). But the 4.3 billion barrels of technically recoverable tight oil from the Bakken (as estimated by the U.S. Geological Survey) is less than one year's worth of crude oil consumption by U.S. refineries.

5. **The RFS hedges oil supply risk for the American consumer and the U.S. economy while simultaneously promoting innovation as a free market would otherwise do on its own**

Given the lack of transparency with regard to global oil supply data, and the clear risks of ongoing dependence on petroleum, it is critical for Congress to stay aggressive with regard to developing alternatives to oil. As part of this imperative, it is important to recognize that federal policy is necessary because the market is not going to promote innovation on its own.

In a price-driven competitive marketplace, the increasing cost and scarcity of crude oil would play to the benefit of alternatives such as advanced biofuels. However, global liquid fuel markets are not free markets. They are collusively price-controlled by OPEC at the global level, and are extremely consolidated and vertically integrated domestically. The absence of free market forces in the liquid fuel marketplace are a problem for the advanced biofuels industry (and other innovators) because a non-competitive marketplace does not properly facilitate and reward innovation. Non-competitive and non-price driven markets are almost impossible to predict with regard to future demand opportunity, because the market does not behave based on free market fundamentals and the creation of a better product does not necessarily translate into market demand. This lack of predictability increases investment risk – or makes risk impossible to assess – which in turns drives investment and potential strategic partners to other sectors.

Much of this testimony has been dedicated to the importance of the RFS with regard to providing biofuel innovators with a reasonable expectation of demand in a broken marketplace. But the value of the RFS can also be viewed through the lens of gas prices and oil supply risk.

---

[17] See Chapman, I., *The end of Peak Oil? Why this topic is still relevant despite recent denials*, Energy Policy (2013). http://dx.doi.org/10.1016/j.enpol.2013.05.010 at pp. 3, 4.
[18] See http://video.cnbc.com/gallery/?video=3000073805.
[19] See http://www.foxnews.com/story/0,2933,222840,00.html

The primary reason Americans are paying significantly more for a gallon of motor fuel or heating oil is the reduced availability of cheap crude oil supply relative to increased demand, and the market response (both direct and via speculation) to this dynamic. The RFS has driven the development of a new alternative fuel industry during a period of very high economic vulnerability and fuel prices in the United States. Speaking to this dynamic, energy economist Philip K. Verleger (who served as an advisor on energy issues to both the Ford and Carter administrations) recently said, "the U.S. renewable fuels program has cut annual consumer expenditures in 2013 between $700 billion and $2.6 trillion ... [t]his translates to consumers paying between $0.50 and $1.50 per gallon less for gasoline."[20] Mr. Verleger notes that the RFS put the equivalent of Ecuador's world oil output on the market during a period of extreme tightness:

> Had Congress not raised the renewable fuels requirement, commercial crude oil inventories at the end of August [2013] would have dropped to 5.2 million barrels, a level two hundred million barrels lower than at any time since 1990 ... [t]he lower stocks would almost certainly have pushed prices higher. Crude oil today might easily sell at prices as high as or higher than in 2008. Preliminary econometric tests suggest the price at the end of August would have been $150 per barrel."

Renewable fuels reduce gas prices in two ways: (1) the predominant fuel used to date to meet the RFS is ethanol, which has been $.60 to $1.00 cheaper per gallon than wholesale gasoline for the bulk of the time that the RFS has been in place; and, (2) by adding supply to very tight oil markets, which reduces the impact of both perceived and real disruptions to supply and curtails speculative engagement by the markets. One would have to stand basic economics on its head to argue that reducing the use of renewable fuels will not increase gas prices.

6. **The climate change and environmental impacts of the RFS should not be analyzed in a vacuum; weakening the program would lead to a number of unintended consequences with regard to air quality, water quality and climate change**

Calls to waive or reduce the RFS targets are often made without apparent consideration for the fact that these gallons would need to be replaced with another (likely petroleum) liquid fuel. Petrobras chief Jose Sergio Gabrielli has declared that "the era of cheap oil is over." This means that oil companies are shifting very quickly to increasing reliance on more expensive and riskier "unconventional" fuels – including tight oil (e.g. the Bakken), deep water (e.g. Gulf of Mexico, Deep Water Horizon) and Canadian tar sands (e.g. Keystone) – to meet the global demand for fuel energy.[21] In essence, what the RFS does is send a signal to an oil-dominated marketplace to include renewable fuels in the quest to commercialize the next gallon of transportation fuel. In almost all cases, the real world alternative to renewable fuel on the margin of the global liquid fuel marketplace is going to be unconventional oil in the near to intermediate term. These fuels are not

[20] See http://www.pkverlegerllc.com/assets/documents/130923_Commentary.pdf.
[21] See http://www.eia.gov/forecasts/aeo/MT_liquidfuels.cfm#crude_oil

just more carbon intensive than the "2005 average petroleum" legislated by Congress in 2007 as the analytical baseline for RFS eligibility, they are far worse than all types of renewable fuels in a number of environmental areas.

For example, numerous studies show that drilling through rock formations has the potential to release (in the absence of containment) a number of hazardous radioactive compounds, such as uranium and thorium, into local waterways and ecosystems.[22] There is also the issue of groundwater contamination from oil and gas wells. The oil industry claims that these incidences are rare, and that generally speaking, oil and gas wells are constructed and abandoned following regulations that protect freshwater aquifers. In fact, the fracking industry is largely unregulated, and the incidences of groundwater pollution are much higher than that. For example, a recent study of documented groundwater contamination incidents in Ohio uncovered ~ 1 incident for every 180 O&G wells drilled during the 25-year study period, and that 22 % (41 out of 185) of these documented O&G-related incidents were related to leakage from orphaned wells.[23] With regard to surface water, many critics of the biofuel industry point to the impact of biofuel production and agriculture on water use and water quality. There is no question that biofuel production and agriculture require water usage. However, as noted by a recent report by several analysts from the Oak Ridge National Laboratory, the oil and gas industry generates more solid and liquid waste than municipal, agricultural, mining and other industrial sources *combined*.[24] And any literature review will demonstrate that while biofuel producers are using less and less water (more than 20 percent reduction in the last ten years), the processes required for the extraction of unconventional oil require more and more water. These oil and gas extraction processes, and their environmental impacts, are relevant to the RFS discussion because: (a) these are the types of petroleum-based fuels that will be used more intensively in the absence of renewable fuels, or instead of waived RFS gallons; and, (2) these fuels make up the real baseline when it comes to assessing the real environmental impacts of ethanol and other biofuels. As such, it is critical to assess the environmental impacts of ethanol and other biofuels relative to the most viable set of fuel alternatives in the immediate to intermediate term.

With regard to greenhouse gas (GHG) emissions, the methodology used for assessing the GHG impact of different categories of renewable fuel actually undercounts the real world GHG benefits of producing and using renewable fuels. The Energy Independence and Security Act of 2007 requires U.S. EPA to compare existing and prospective types of renewable fuel against the average carbon intensity of U.S. gasoline in 2005. This legislated baseline clarifies the assessment methodology for U.S. EPA, but undervalues the real world benefits of blending renewable fuels because the new types of petroleum coming into the global liquid fuel marketplace on the "margin"

---

[22] See Esther S. Parish, Keith L. Kline, Virginia, H. Dale, Rebecca A. Efroymson, Allen C. McBride, Timothy L. Johnson, Michael R. Hilliard, et al., *Comparing Scales of Environmental Effects from Gasoline and Ethanol Production, (2012).*

[23] See http://fracfocus.org/sites/default/files/publications/state_oil_gas_agency_groundwater_investigations_optimized.pdf

[24] See Esther S. Parish, Keith L. Kline, Virginia, H. Dale, Rebecca A. Efroymson, Allen C. McBride, Timothy L. Johnson, Michael R. Hilliard, et al., *Comparing Scales of Environmental Effects from Gasoline and Ethanol Production (2012), p. 26.*

are significantly more carbon intensive than average gasoline in 2005. Put another way, while U.S. EPA has concluded that the biofuels being used under the RFS today meet or exceed the GHG standards legislated as part of EISA07 (i.e. as compared to 2005 gasoline), these renewable fuels are an alternative to other (petroleum-derived) liquid fuels on the margin that are significantly more carbon intensive than the 2005 petroleum baseline. For example, with the Keystone Pipeline question in mind, a recent report released by the Congressional Research Service (CRS) found that Canadian oil sands are 14-20 percent more carbon intensive than the 2005 EPA baseline.[25] The report also quantified the carbon intensity of a number of other types of "marginal" petroleum, and found that many of the most common imports (e.g. Venezuela, Mexico, and Nigeria) are significantly more carbon intensive than the 2005 petroleum baseline.

7. **Changing the rules in the middle of the game would send a negative signal to investors interested in committing to clean energy development projects in the United States**

One of the many extraordinary aspects of the RFS is the duration of the commitment (15+ years). Long-term policy commitments reduce investment risk and attract private capital from around the world to achieve the policy objective at hand. With the notable exception of the permanent federal tax incentives offered to fossil fuels and nuclear, we are unaware of any other federal energy policy that makes this type of long term commitment to achieve energy security. In very simple terms, it is a cornerstone to dozens of U.S. advanced biofuel projects, such as those detailed in the AEC progress report, and potentially hundreds of projects in the future. As discussed, these projects are under development notwithstanding the lack of free market forces (that would otherwise reward innovation) because the RFS partially ameliorates the non-competitive nature of the global fuels market by providing clear and predictable demand targets over time.

It would be a huge step backwards for the advanced biofuel industry – and U.S. energy policy credibility in general – if Congress decides to change its mind on a landmark energy policy just five years in to a fifteen year commitment. Changing the RFS at this point will send a clear message to the energy investment marketplace (for this and other energy policies) that Congress is willing to change the rules in the middle of the game, strand billions of dollars of investments and drive future innovation spending to other countries or sectors based on spurious claims by incumbent industries.

The oil industry understands sensitivity of the investment marketplace to the reality or appearance of policy uncertainty, which is why the oil trade associations are putting so much effort into creating the perpetual prospect that Congress will not honor its original 15 year commitment to the RFS. It is important to note that this perpetually uncertain political landscape is a serious global competitiveness issue, because it stands in stark contrast to the extensive, multiyear commitments made by our competitors (e.g. China, Brazil) to the development of renewable energy. With specific regard to China, which spends nearly $12 billion per month on clean energy development, former

[25] See http://www.fas.org/sgp/crs/misc/R42537.pdf

U.S. Commerce Secretary Gary Locke noted, "they're doing this because they really want to be the world's supplier of clean energy and they recognize this will support millions of jobs."[26]

Quite simply, the RFS is the global gold standard when it comes to advanced biofuel policy. It is the U.S. advantage when it comes to attracting a quickly innovating, global advanced biofuels industry to the U.S. soil, and it has already fundamentally changed the U.S. liquid fuel marketplace for the better. But if there is no certainty going forward around the policy commitments that Congress has made, the private sector is not going to take the capital risk in these projects despite the obvious value proposition of producing advanced biofuels at cost competitiveness with oil.

As such, we strongly encourage the Committee to consider the fact that legislative intervention at this point in the deployment of the RFS is unwarranted, would send highly unproductive signals to the clean energy marketplace, and would be the equivalent of exporting the advanced biofuels industry opportunity to other countries that are maintaining their long-term commitment to renewable fuels.

Recommendations:

The Advanced Ethanol Council encourages Congress to pursue the following initiatives to facilitate the rapid deployment of advanced biofuels:

1. Clearly message that the RFS is a landmark policy and should be left alone at the legislative level
2. Work with U.S. EPA at the administrative level to address any concerns Congress might have, including the recent proposal to overly reduce the 2014 RVO
3. Work with the committees of jurisdiction to take the biases out of the federal tax code that favor oil and gas development over renewable fuel development
4. Continue to support a robust energy title in the farm bill in recognition of the fact that American agriculture is well-suited to produce food, feed and energy
5. Facilitate a more price-driven, competitive marketplace by pursuing legislative (outside of the RFS) and administrative ways to open market access for biofuels via: (a) the more aggressive deployment of FFVs; (b) eliminating unnecessary delay with regard to RFS pathway approval and regulatory adjustments for legal fuel blends (e.g. RVP, E15); (c) the more aggressive deployment of higher biofuel blend refueling infrastructure; and, (d) closer scrutiny of potentially illegal oil industry behavior with regard to discouraging legal biofuel blending through franchise relationships.

Thank you for the privilege of speaking before you today. I look forward to your questions.

[26] See http://yaleglobal.yale.edu/content/chinas-green-ambition-us-sees-red

Attachment A

Easy Answers to a Number of Complex Allegations Made Against the RFS

1. **"The RFS has increased corn feed prices and hurt the livestock industry."**

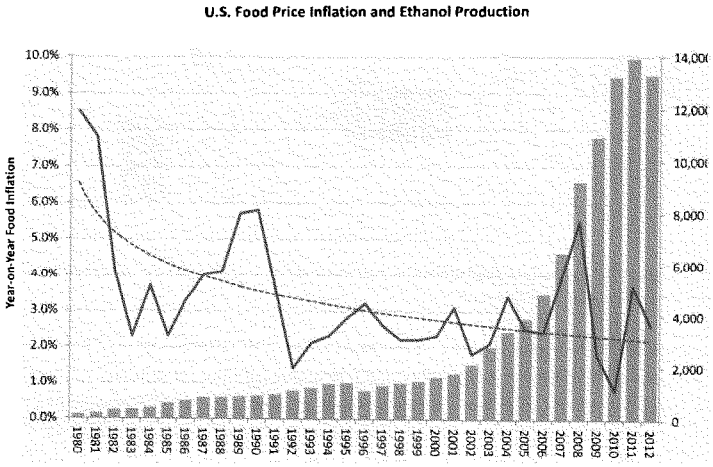
Corn prices today are almost identical to corn prices on the day that President Bush signed RFS2 in December 2007. Generally, corn and other agricultural commodity prices have gone up and down with oil price as the economy adjusts to a new equilibrium in world oil markets.

2. **Higher RIN prices in 2013 are a cost of compliance for oil companies that will ultimately increase gas prices**

Many oil companies are now on record on earnings calls attesting to the fact that they are the ones *profiting* from higher RIN values, because they get the RIN for free when they buy a gallon of renewable fuel and can sell it to other obligated parties.[27]

3. **"The RFS has increased food prices in the grocery aisle."**

Food prices are not increasing, and they are decreasing *against* the increase in ethanol use.



[27] See: http://www.fuelsamerica.org/blog/entry/something-funny-about-those-oil-company-profits

4. "E15 is a threat to boaters and small engines."

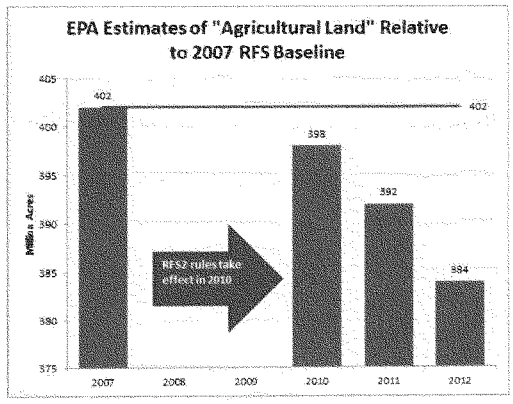
E15 is an option at the pump, as opposed to the new baseline fuel. Boaters and small engine users can simply fill up with other fuel to avoid higher ethanol blends if they want to.

5. "The RFS increases the price of gasoline."

Energy economist Philip K. Verleger (who served as an advisor on energy issues to both the Ford and Carter administrations) recently said, "the U.S. renewable fuels program has cut annual consumer expenditures in 2013 between $700 billion and $2.6 trillion ... [t]his translates to consumers paying between $0.50 and $1.50 per gallon less for gasoline."[28]

6. "The increased use of biofuels has resulted in the plowing of virgin and pristine land."

The national agricultural footprint is not expanding, it's contracting.



There is always some regional variation with regard to agricultural land use, but recent allegations about prairie conversion are misleading:

- Critics of the RFS point to reduced acreage in the Conservation Reserve Program (CRP), but acreage in the program went down commensurate with the funding cut in the 2008 farm bill.
- Allegations about "15 million more corn acres planted" are true, but should be considered relative to the more than 20 million acres of wheat taken out of production during the same period. Crops are generally rotating, not expanding.
- Wheat acres dropped more than corn acres increased in the specific states that the Associated Press claimed were using pristine lands for corn ethanol production.

[28] See http://www.pkverlegerllc.com/assets/documents/130923_Commentary.pdf.

7. "The RFS has not decreased climate change emissions."

This claim is inconsistent with the position of U.S. EPA and relies on a distortion of their analysis. U.S. EPA debited biofuels for *future* theoretical land use change and therefore decided to take into account future efficiencies relative to a 2005 gasoline baseline that is far dirtier today. Critics of the RFS want use future land use change penalties but eliminate future efficiencies with regard to production.

8. "The boom in domestic oil production renders the RFS outdated policy."

Americans and the U.S. economy are still at great risk to dwindling world supplies of oil. The increase in U.S. oil output (up 12% in 2012) pales in comparison to what is going on with OPEC. John Hofmeister, former President of Shell Oil, recently told CNBC that, "I think OPEC is about maxed out ... when people talk about spare capacity in OPEC, I don't see it. I just don't see it coming through and I'm not sure it's there."

In addition, oil analysts have a long history of vastly over estimating new reserves:

a. In 2002, the U.S. Geological Survey estimated that the National Petroleum Reserve-Alaska contained 10.6 billion barrels (mean estimate) of oil. In late 2010, USGS revised their estimate to 896 million barrels – a downward adjustment of roughly 90 percent.[29]

b. When BP discovered the Thunder Horse field in the Gulf of Mexico in 1999, they estimated that the reserve contained more than a billion barrels of oil. The discovery fundamentally changed projections about U.S. oil capacity and was credited with changing the global price of oil. BP and partners built the largest oil platform in the Gulf. However, oil extraction was delayed by more than 3 years due to technical difficulties, and according to a consultant for oil exploration, "Thunder Horse hasn't reached anywhere near its expected potential."[30]

c. Proponents of the "domestic oil boom" also point to a recent International Energy Agency (IEA) report concluding that U.S. dependence on foreign oil will come down significantly due to the recovery of very large "tight oil" reserves (e.g. the Bakken). This agency predicted in 2000 that deep water reserves would supply massive quantities of oil to U.S. and global markets between 2000-2010, and oil prices would therefore be relatively low ($28.25 per barrel) in 2010. In fact, those reserves did not come online as quickly or as substantially as predicted (see above), and the price per barrel of oil in 2010 was $79.61.[31]

---

[29] See http://www.newsminer.com/news/alaska_news/oil-estimates-slashed-for-national-petroleum-reserve-alaska/article_999d982e-5823-59c2-82f7-8b6bb65d8fd6.html.
[30] See http://www.theoildrum.com/node/6415.
[31] For more information, see article in *Christian Science Monitor* at http://www.csmonitor.com/Environment/Energy-Voices/2013/0520/When-oil-forecasts-get-it-wrong.

United States Senate Committee on Environment and Public Works

Answers to Follow-Up Questions From
12/11/13 Oversight Hearing on Domestic Renewable Fuels

Brooke Coleman
Executive Director, Advanced Ethanol Council

March 19, 2014

Chairwoman Boxer, Ranking Member Vitter, and Members of the Committee,

Thank you for the opportunity to address the following follow-up questions from the Oversight Hearing on Domestic Renewable Fuels. We would be happy to address any further questions or comments that you might have. And thank you for the opportunity to testify on December 11th.

Questions from Senator Boxer

1. **When the 2007 RFS was passed in Congress, was it anticipated that the full RFS mandate of 36B gallons of advanced biofuels would result in the blending of fuels with a content of more than 10% ethanol?**

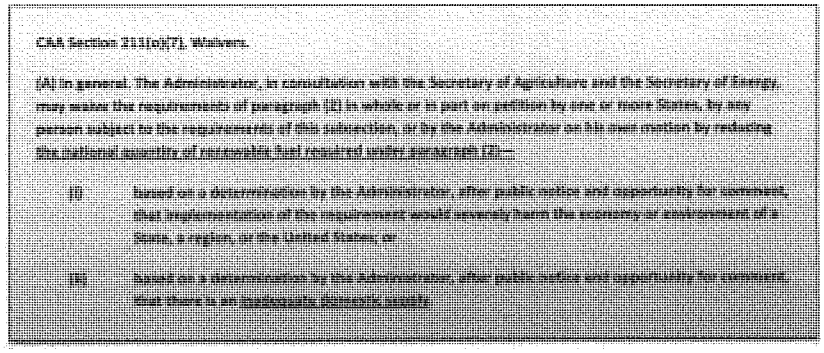
When the RFS was amended in 2007, Congress was well aware that blending 36 billion gallons of renewable fuel annually by 2022 would require investment in renewable fuel infrastructure, distribution and blending capabilities. In the basic sense, this is why Congress included so many provisions dedicated to "biofuels infrastructure" in the Energy Independence and Security Act of 2007, including the "Prohibition on Franchise Agreement Restrictions Related to Renewable Fuel Infrastructure;" the "Prohibition on Restriction of Installation of Renewable Fuel Pumps;" studies related to "Renewable Fuel Dispenser Requirements" and "Ethanol Pipeline Feasibility;" and a program called "Renewable Fuel Infrastructure Grants." More specifically, the 2007 RFS requires obligated parties to blend a wide variety of biofuel types in a flexible manner, of which ethanol – both conventional and advanced – is a part. From a macro perspective, Energy Information Administration (EIA) forecasts in 2007 predicted that U.S. demand for gasoline, diesel and fuel oil would be about 272 billion gallons in 2022.[1] As such, the 36 billion gallon RFS would constitute more than 13 percent of this marketplace. However, ethanol was expected to account for the majority of the 36 bgy/2022 standard by virtue of the fact that conventional ethanol was expected to account for nearly the entire conventional biofuel requirement (15 bgy by 2015, then constant thereafter) and cellulosic ethanol was expected to account for the majority of the cellulosic biofuel requirement (16 bgy by 2022). Given that ethanol is a gasoline substitute, it is instructive to look at these numbers relative to expected gasoline demand. In 2007, EIA estimated that there would be roughly 164 billion gallons of motor gasoline demand in 2022. It is straightforward to run hypotheticals based on these numbers. For example, if the entire 15 bgy conventional biofuel requirement was fulfilled by conventional ethanol (likely) and the entire cellulosic biofuel standard was fulfilled by cellulosic ethanol (possible), then the RFS would require roughly 19 percent of the gasoline pool to be ethanol by 2022. Even if you assume that cellulosic ethanol only accounts for half of the cellulosic biofuel standard (highly conservative), the RFS would still require roughly 14 percent of the

[1] See http://www.eia.gov/forecasts/archive/aeo07/supplement/index.html

gasoline pool to be ethanol (of various types) by 2022.[2] If Congress wanted to set the RFS to arrest at 10 percent of gasoline demand, they could have made the RFS a percentage based requirement or explicitly called for waiver adjustment based on percentage of demand. But Congress did not take this path, and continuing to protect 90 percent of the motor fuel marketplace for gasoline only would have been inconsistent with the broader objectives of the Act.

2. The Energy Information Agency's (EIA) recent modeling suggests that second generation biofuels will never reach the statutory mandated levels in 2022. Do the EIA projections accurately reflect what the advanced biofuels industry will produce by 2022? Should the 2022 target be revisited? If not, why not?

The 2007 RFS set aggressive blending requirements for second generation biofuels to send a clear signal to the investment marketplace to be aggressive in its development of these fuels and technologies. However, Congress also provided U.S. EPA with the authority to waive the advanced biofuel standards in the event that commercial deployment lagged behind the standards. Congress does not need to revisit the 2022 targets for advanced biofuels because U.S. EPA already has the authority to do so.



CAA Section 211(o)(7), Waivers.

(A) In general. The Administrator, in consultation with the Secretary of Agriculture and the Secretary of Energy, may waive the requirements of paragraph (2) in whole or in part on petition by one or more States, by any person subject to the requirements of this subsection, or by the Administrator on his own motion by reducing the national quantity of renewable fuel required under paragraph (2)—

(i) based on a determination by the Administrator, after public notice and opportunity for comment, that implementation of the requirement would severely harm the economy or environment of a State, a region, or the United States; or

(ii) based on a determination by the Administrator, after public notice and opportunity for comment, that there is an inadequate domestic supply.

U.S. EPA did not waive the broader advanced biofuel standard through 2013 because there was adequate supply of advanced biofuels to meet the legislated standard.[3] However, the proposed 2014 RFS Required Volume Obligation (RVO) would, for the first time, reduce the advanced biofuel blending requirement pursuant to EPA authority contained in CAA Section 211 (o)(7). While we continue to believe that EPA's proposal to cut the advanced biofuel requirement is too aggressive, it is nonetheless clear evidence that the agency is unafraid to exercise its authority to waive the RFS based on supply. As such, there is no need for Congress to revisit the RFS at the legislative level.

With regard to EIA accuracy, we support and commend their diligence and mission while recognizing that modeling future production capacity and demand is notoriously inaccurate. The ability to

[2] Calculation: 15 bgy + 8 bgy (half of 16 bgy cellulosic standard) = 23 bgy, which is 14% of the forecasted 164 billion gallons of motor gasoline demand in 2022.

[3] EPA did waive the cellulosic biofuel standard, but concluded that there were sufficient volumes of other types of advanced biofuels to maintain the broader advanced biofuel standard.

forecast/model alternatives to petroleum depends largely on the price and availability of crude oil. And yet, there is virtually no transparency when it comes to "source data" for the myriad of claims about future oil markets made on an everyday basis by analysts in the sector. For example, Russia (one of the world's largest conventional oil producers) declared all oil data a state secret in 2004. Neither Saudi Arabia nor Venezuela share data publicly when they make claims about future capacity. This is a concern in part because "there are political and financial pressures to misreport figures."[4] The pressures are obvious. OPEC member quotes are based on reported reserves; the higher the reserve, the higher the quota relative to other members. There is also the challenge of attracting investment, from both government and outside sources. As reported in a recent peer-reviewed article in *Science*, "there are fears that Saudi oil reserves (and others) may have been over-estimated by at least 40%," and, "[a]t best Saudi reserves are seen as near maturity," given that 7 million barrels of sea water are being injected in the main field on a daily basis to increase flow.[5] The oil industry and OPEC also has the incentive of exaggerating reserves to weaken political and market interest in developing alternatives. OPEC first admitted its concern about alternative fuels in 2006, when it openly admitted that its price setting is designed partially to deter their use.[6]

We also know that with the right market signals, the renewable fuels industry can ramp up production very quickly. For example, few analysts believed 10-12 years ago that the ethanol industry could ramp up quickly enough to completely replace the gasoline additive MTBE. The industry more than met the challenge and the MTBE phase out occurred in a matter of months. Many of the companies building first commercial cellulosic ethanol plants also own numerous conventional ethanol plants (e.g. POET, Abengoa, etc.). This puts them in a position of being able to scale their cellulosic ethanol production capacity very quickly by redeploying the technology used at their first commercial cellulosic ethanol plant across their entire portfolio of plants. While we are not in a position to make point estimates of our capacity in 2022, it is clear that the industry is emerging and the need for affordable, domestically-produced, low carbon fuel is as urgent today as it was in 2007.

3. **Do higher RIN prices lead to increased gasoline prices? Please explain your answer.**

With regard to cost, the RFS basically imposes two realities on the liquid fuel marketplace: (1) the potential cost of paying for RINs if obligated parties choose not to blend more renewable fuel; and, (2) the cost or savings of the qualifying renewable fuel required by the program. Looking at RINs first, higher RIN prices are not costing the American consumer money because RINs enter the marketplace free of charge. For example, a D6 "conventional renewable fuel" RIN is generated with every gallon of renewable fuel produced, and cannot be separated for sale by the renewable fuel producer. RINs are separated for sale *by obligated parties*, so the profit from sale or cost incurred from purchase exists within the oil industry. This is why so many oil companies are now on record on earnings calls attesting to the fact that they were the ones *profiting* from higher RIN values in 2013 (i.e. because they get the RIN for free when they buy a gallon of renewable fuel and can sell it to other obligated parties for a

[4] Chapman, I., *The end of Peak Oil? Why this topic is still relevant despite recent denials*, Energy Policy (2013). http://dx.doi.org/10.1016/j.enpol.2013.05.010 at p. 3.
[5] See Chapman, I., *The end of Peak Oil? Why this topic is still relevant despite recent denials*, Energy Policy (2013). http://dx.doi.org/10.1016/j.enpol.2013.05.010 at p. 4.
[6] See http://www.foxnews.com/story/0,2933,222840,00.html

profit).[7] Theoretically, one could argue that RINs are a cost to obligated parties more broadly if the cost of the RIN is passed through to the ethanol producer at the point of sale. But a basic correlation analysis shows that higher RIN prices did not result in higher prices for biofuel. See figures below.

Examples of Oil Industry Earnings Call Statements Regarding RINs

American Petroleum Institute — The Mirage: Says its members are getting hit by high RIN prices, the costs of which are being passed through to consumers at a rate of $14 billion per year

- **"RIN prices are near an all-time high … the RFS is a grave economic threat and must be stopped immediately."**
  - Jack Gerard, testimony to Energy and Commerce Committee, July 2013

BP — Says it has profited from RIN trading

- **"We're net long RINs. We've been able to trade into this spike recently and done quite well out of it. I'm very pleased about that."** (http://www.reuters.com/article/2013/07/30/bp-rins-idUSL1N0G00XG20130730)

ExxonMobil — Says that the obligation to purchase RINs has not affected its earnings

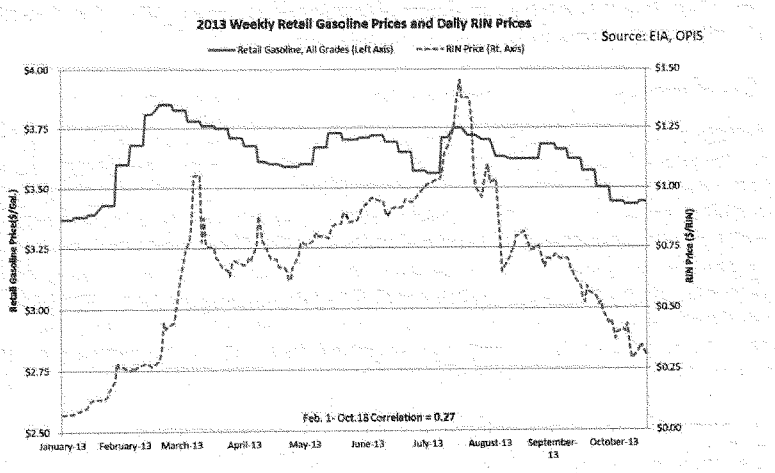
- **"No, not at all."**
  - David Rosenthal, Vice President of Investor Relations & Secretary, when asked by an analyst if RINs had any material impact on ExxonMobil's quarterly financial performance (ExxonMobil 2nd Quarter Earnings Call, 8-1-2013)

Murphy Oil — Says it has profited from higher RIN prices

- Murphy reported the increase in its refining/marketing income in the quarter was **"…primarily due to better results for ethanol production operations and higher sales prices for ethanol renewable identification numbers (RINs) in the current period. …Profit from ethanol RIN sales was higher in 2013 due to significantly stronger sales prices for these credits."** (http://online.wsj.com/article/PR-CO-20130731-916461.html)

Oil Industry Economist — Philip K. Verleger says renewable fuels have saved consumers at least hundreds of billions

- **"The US renewable fuels program has cut annual consumer expenditures in 2013 between $700 billion and $2.6 trillion. This translates to consumers paying between $0.50 and $1.50 per gallon less for gasoline."** (http://www.pkverlegerllc.com/assets/documents/130923_Commentary1.pdf)



[7] For summary of oil companies RIN profits, see: http://www.fuelsamerica.org/blog/entry/something-funny-about-those-oil-company-profits.

With regard to the cost of the qualifying fuel, higher RIN prices have the practical effect of increasing the available supply of affordable liquid fuel during a period of tightness in the global supply of petroleum. Energy economist Philip K. Verleger (who served as an advisor on energy issues to both the Ford and Carter administrations) recently said, "the U.S. renewable fuels program has cut annual consumer expenditures in 2013 between $700 billion and $2.6 trillion ... [t]his translates to consumers paying between $0.50 and $1.50 per gallon less for gasoline."[8] Other assessments have reached a similar conclusion.[9] The most recent is a paper published by former EPA contractor Bruce A. Babcock and Sebastien Pouliet from the Center for Agricultural and Rural Development (CARD), supported by the National Science Foundation, which seeks to "estimate the impact of RIN prices on the pump price of fuel."[10] CARD has developed a model to predict a range of different market impacts occurring as a result of the RF5. Among other findings, the paper concluded that:

- "... feasible increases in the ethanol mandate in 2014 will cause a small *decline* in the price of E10 [the predominant blend of gasoline in the market today]."
- "... one of the costs that does not need to be considered is an increase in the pump price of fuel, because we show that the most likely outcome from increasing ethanol mandates is a drop in pump prices, not an increase."
- "The oil industry continues to rely on their own commissioned study (NERA 2012) that predicts gasoline producers will have no choice but to cut domestic sales of gasoline to reduce their obligations under the RFS ... [t]he study's conclusions – that expansion of ethanol mandates would cause severe damage to the economy – are simply not credible unless EPA were to ignore set mandates at such a high level that they literally could not be met regardless of the level of investment in new fueling infrastructure."
- "Our results should reassure those in Congress and the Administration who are worried that following the RFS commitment to expanding the use of renewable fuels will result in sharply higher fuel prices for consumers."
- "The reason the oil industry and much of the livestock industry have joined forces against biofuels is one of simple industry economics: their industries would benefit from cheap corn and reduced competition from ethanol."

4. Can you please summarize the feedstocks other than corn that are used to produce advanced and cellulosic biofuels?

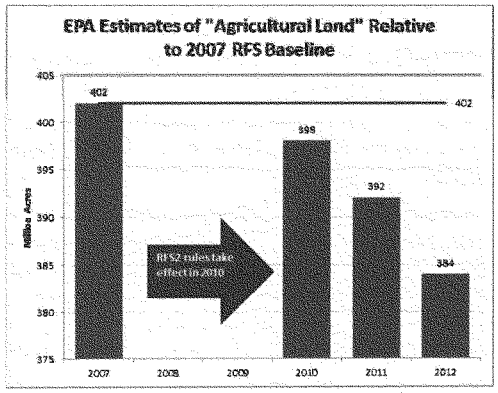
The AEC detailed a number of leading advanced biofuel projects under development, including feedstock utilized, in its 2013 Cellulosic Biofuels Progress Report.[11] The report details 16 cellulosic projects making advanced and cellulosic biofuels from agricultural residues (wheat straw, barley straw,

[8] See http://www.pkverlegerllc.com/assets/documents/130923_Commentary.pdf.
[9] See, for example, Cui, J., H. Lapan, G. Moschini, and J. Cooper. (2010). "Welfare impacts of Alternative Biofuel and Energy Policies." American Journal of Agricultural Economics 93(5): 1235-1256.
[10] See http://www.card.iastate.edu/publications/dbs/pdffiles/14pb18.pdf at p. 5.
[11] See http://ethanolrfa.org/page/-/PDFs/AEC%20Cellulosic%20Biofuels%20Industry%20Progress%20Report%202012-2013.pdf?nocdn=1

corn stover, rice straw, bagasse), forestry residues (wood chips and pulp), planted poplar trees, waste industrial gases, vegetative and yard waste, and municipal solid waste (including used telephone poles).

5. **Does evidence support that there is enough land to meet food needs, produce the levels of RFS biofuels mandated for 2022, and protect critical habitat and the environment? Please provide sources supporting your answer.**

The evidence shows that there is enough land to meet both food and fuel needs, while protecting habitat. It is important to consider that the U.S. agricultural footprint has been shrinking rather than growing for decades due to yield-per-acre increases and despite major population growth.[12] EPA has also noted that the U.S. agricultural footprint has continued to contract since the passage of the RFS.



Source: Figure produced by RFA, based on EPA data

This data is particularly interesting because the build-out of the corn ethanol industry to meet the 15 bgy requirement has already occurred (i.e. the RFS requires no more than 15 bgy of corn ethanol use by 2015, then maintains this standard through 2022). December 2013 EIA production data show that the existing corn ethanol industry has more than 14.5 billion gallons of annual production capacity.[13] Generally speaking, the ethanol industry is building out at this point via cellulosic feedstock utilization technology and plant efficiency as opposed to new plant construction.

Land use critics of the RFS often point to increases in corn acreage and decreases in Conservation Reserve Program (CRP) acreage since the passage of RFS2 to support the argument that the policy threatens natural ecosystems. However, these analyses almost always exclude critical facts. First, a basic analysis of the five largest crops in the United States shows that corn planting has increased since 2008, but acreage for the four other major crops (wheat, soy, cotton and hay) has decreased by more than the increase in corn acreage.[14] This fact suggests that total acreage continues to decline, and corn has

[12] See http://www.epa.gov/oecaagct/ag101/landuse.html
[13] See http://www.eia.gov/dnav/pet/pet_sum_snd_d_nus_mbblpd_m_cur.htm
[14] See http://www.nass.usda.gov/Statistics_by_Subject/index.php?sector=CROPS

replaced other crops as a natural response to market price rather than pristine land. Second, CRP acreage has declined from ~33.7 million acres when President Obama took office to 29.5 million acres in 2012. But the drop is commensurate with the declining CRP acreage caps passed as part of the 2008 farm bill. The CRP program pays farmers to keep acreage out of production. Farmers are going to put acres back in production if they are no longer getting paid to keep them out of production. That said, acreage enrolled in the program is actually closer to the legislated caps since the passage of RFS2 than before RFS2, which suggests a strong ongoing interest in the program.[15] Finally, the evidence does not support the argument that farmers are filling in wetlands to plant feedstock for biofuel. Acreage enrolled in the Wetlands Reserve Program (WRP) hit a record high of 2.65 million acres in 2012, and land entered into the WRP program is enrolled permanently or for a period of 30 years.[16]

While it is more difficult to assess the potential impact of advanced biofuels on land use and ecosystems because we do not have the benefit of hindsight, some modeling work has been conducted. According to the Sandia National Laboratory, the U.S. could produce 75 billion gallons per year of cellulosic biofuels – 4.5 times that required by RFS2 – without displacing food and feed crops.[17] A study by DOE/Oak Ridge National Laboratory projects that the RFS will create an increase of 0.8% in U.S. gross domestic product (GDP) in 2022 well in excess of $100 billion stemming from the fact that the RFS is reducing crude oil prices, decreasing crude oil imports, increasing gross domestic product (GDP), and having only minimal impacts on global food markets and land use. With regard to land use, the study concluded that RFS2 will result in "...a slight [net] reduction in global land use for agriculture."[18] The report also concluded that: (a) any marginal increase in agricultural land use resulting from RFS2 would be largely constrained to the U.S. and would be offset by decreases in land use in other regions; and, (b) U.S. agricultural land use would be just 0.4% higher in 2015 than would be the case without the RFS2 in place.

The RFS is a well-crafted law. It has reduced petroleum dependence, helped mitigate GHG emissions, created jobs and reduced gasoline prices by extending global liquid fuel supplies during a period of tightness. The price of corn today is roughly the same as it was when the Act was signed in 2007, and empirical data does not support the argument that the country is experiencing deleterious land use change. Perhaps most importantly, the RFS is an advanced biofuel policy going forward.

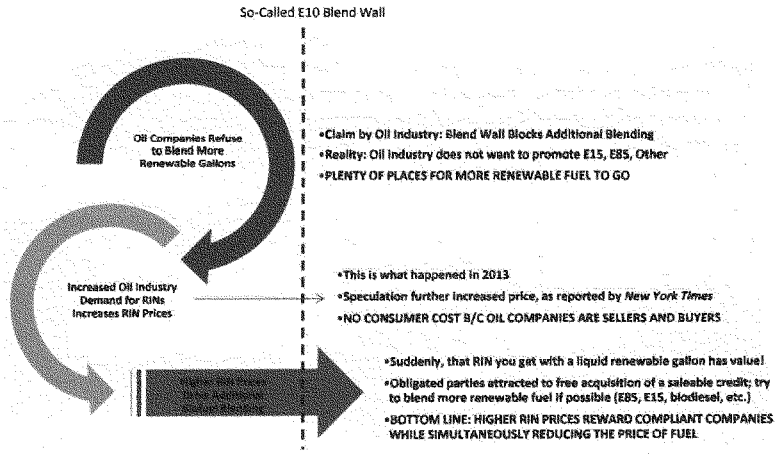
[15] See http://www.fsa.usda.gov/FSA/webapp?area=home&subject=copr&topic=rns-css
[16] See http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/easements/wetlands/
[17] See https://share.sandia.gov/news/resources/news_releases/biofuels-can-provide-viable-sustainable-solution-to-reducing-petroleum-dependence-say-sandia-researchers/.
[18] See http://www.future-science.com/doi/abs/10.4155/bfs.12.60?journalCode=bfs.

Questions from Senator Carper

1. **Under EPA's analysis in the recent 2014 proposed rule, the agency has determined there is not the available infrastructure to handle the increased levels of biofuels required under the Clean Air Act. If the EPA adjusts the RFS downward to meet the current infrastructure, what drives new investments in infrastructure to handle future volume requirements?**

The RFS is designed to drive investment in more renewable fuel blending (including infrastructure), not the other way around. The primary driver of additional biofuel market access within the RFS is the RIN. A RIN is an identification number generated when a gallon of RFS-qualifying renewable fuel is produced. The RIN is attached to the renewable fuel gallon at the point of sale to obligated parties (i.e. oil companies), but can be separated (from the liquid gallon) by obligated parties and sold for whatever price the market will bear. The primary value of the RIN program, other than facilitating compliance and some level of compliance flexibility, is its ability to increase market access for renewable fuels. That is, when an oil company refuses to blend more liquid biofuel, they can buy a RIN on the open market instead. If a significant number of oil companies refuse to blend liquid gallons and seek RINs on the open market, RIN trading and values will increase as a result of their affirmative non-compliance. Higher RIN prices then provide an extra incentive for other obligated parties to blend liquid renewable fuel gallons, because they acquire a valuable and saleable RIN free of charge with each gallon of renewable fuel purchased. In essence, higher RIN values reward good behavior and facilitate the objectives of the RFS.

How RINs Work to Facilitate Objectives of RFS



Source: AEC Presentation, Third Way Senate Briefing, November 19, 2013

The RIN is a critical market driver for the advanced biofuels industry. Nearly 40 leading developers of cellulosic biofuel wrote a letter to President Obama in October 2013, stating:

> "The RFS is engineered to address challenges like the oil industry's historic and current refusal to blend more renewable fuels. Investors in next generation biofuels understand how the RFS and RIN values work to introduce market access for advanced biofuels. As such, any perceived unwillingness on the part of RFS administrators to allow the program to work would send a clear signal to the advanced biofuel marketplace that the RFS may not be allowed to change market behavior as promised. This mere possibility increases investment risk, which in turn decreases the effective deployment of advanced biofuels.[19]

As such, the immediate effect of any proposal to use less renewable fuel will be the deflation of RIN prices, which in turn will eliminate the incentive to invest in strategies to use more renewable fuel.

We would also like to mention a series of papers published by the Iowa State University Center for Agricultural and Rural Development (CARD) looking at the feasibility and cost of increasing ethanol consumption. The papers covering E85 penetration are based on a peer-reviewed model designed to predict E85 demand in the United States. The model and analysis were conducted by Bruce A. Babcock (among others) who was contracted by EPA for various types of analysis during the initial RFS rulemaking. A January 2014 paper on the subject, entitled "Feasibility and Cost of Increasing US Ethanol Consumption Beyond E10," concluded that EPA could set the 2014 total renewable fuel target at 14.4 billion gallons and meet that standard with: 13 billion gallons of ethanol in E10, 800 million gallons of ethanol in E85, and the use of 600 million banked RINs *without any additional E85 stations being built*.[20] The CARD model forecasts that in such a scenario, D6 RINs would settle at about 69 cents per RIN – far lower than the peak values experienced in 2013. But with 500 additional E85 stations added, the D6 RIN price would drop to 18 cents. To put the latter scenario in perspective, one company (Protec Fuel) was on the verge of selling enough new E85 pumps to just two oil refineries to increase the number of stations that sell E85 by 450.[21] According to the CARD paper, "this one sale would have accomplished a dramatic decrease in RIN prices."[22] The Reuters report states that, "those deals are on hold after the U.S. Environmental Protection Agency's proposal earlier this month to slash the minimum volume of ethanol to be used in the country's gasoline supply next year." The January 2014 CARD paper also makes several other points that are relevant to the proposed rule published by EPA (emphasis added):

- "[T]he assumption by EPA that a 14.4 billion gallon ethanol mandate in 2014 was not feasible is not correct."
- "These results demonstrate that meeting a 14.4 billion gallon mandate is feasible in 2014 with no new stations, modestly lower E85 prices [than prices in January 2014, after EPA's proposal crushed RIN prices], and judicious use of available carryover RINs."

---

[19] See http://www.reuters.com/article/2013/10/29/bio-aec-wh-letter-idUSnBw296398a+100+BSW20131029; for copy of letter: http://www.ethanolrfa.org/page/-/PDFs/AEC%2C%20BIO%20letter%20to%20POTUS%20on%202014%20RVOs.pdf?nocdn=1

[20] See http://www.card.iastate.edu/policy_briefs/display.aspx?id=1217.

[21] See http://www.reuters.com/article/2013/11/27/us-usa-ethanol-e85-analysis-idUSBRE9AQ1AU20131127

[22] http://www.card.iastate.edu/policy_briefs/display.aspx?id=1217, at footnote 10.

- "EPA's justification for reducing ethanol mandates means that mandates will not be increased beyond E10 levels until the number of stations that sell E85 increase significantly. Our results demonstrate that the number of stations that sell E85 will not increase until EPA sets the ethanol mandates beyond E10 levels. If increased mandates need to wait for the stations to be built, mandates will never increase."
- The installation of 500 new E85 stations would cost just $65 million and reduce D6 RIN prices to 18 cents, but "RIN prices could be reduced to less than one cent if 1,500 new E85 stations were strategically installed. This number of stations would reduce compliance costs to Delta and all other refineries [who make the affirmative decision to buy RINs instead of liquid gallons] to near zero in 2014."

How do we get past the blendwall? How do we incentivize the increased investments in E85 pumps, E 15 pumps and vehicles that are optimized for future ethanol blends?

First and foremost, we believe that the imposition of the so-called blend wall is overstated. EIA data shows that 15.4 million flex fuel vehicles (FFVs) capable of operating on blends up to E85 were sold from 1998 through 2012.[23] Assuming 2013 FFV production and sales levels were consistent with 2012 rates, approximately 17.8 million FFVs have been sold since 1998. Even if one assumes that the agency assumed that all pre-2002 FFVs are no longer in service (based on an average vehicle lifespan of 11 years), there would still be 15.9 million FFVs on U.S. roadways today. Accordingly, the current fleet of FFVs alone is capable of consuming roughly 7 billion gallons of ethanol annually (9.5 billion gallons of E85). In addition, approximately 80% of current light-duty automobiles in service were built in 2001 or later, which means that four out of every five cars and light trucks on the road are approved by EPA to use E15. Further, the use of E15 is explicitly approved by the manufactures of more than 60% of model year (MY) 2014 of the light-duty vehicles sold in the United States. Automakers offering unequivocal E15 warranty coverage for some or all of their MY2014 vehicles include General Motors, Ford, Toyota, Honda, Volkswagen, Mercedes-Benz, Jaguar, and Land Rover. Moreover, all automakers manufacturing FFVs, including Chrysler, Nissan and Audi, warranty the use of E15 in FFV models.[24] The question, then, is how to get the fuel to the consumer – and the path goes through the oil industry. As such, the single most important way to achieve these objectives is leaving the RFS alone at the legislative level and ensuring that it is properly administered at the agency level. If this happens, there will be a clear signal to the marketplace that more renewable fuel is going to be used, and investments will be made. It would also be helpful for regulators to remove unnecessary roadblocks to higher blends. For example, EPA has thus far refused to address regulatory inconsistencies with regard to vapor pressure for E15 that are contributing to the slower than necessary deployment of the fuel. EPA has also refused to provide proper credit for FFVs in the updated CAFE standards. We would very much appreciate working with your office on these important matters, because they speak directly to the future of advanced ethanol. But maintaining the RFS is a cornerstone to the whole process.

[23] See http://www.afdc.energy.gov/uploads/data/data_source/10299/10299_afv_available.xlsx
[24] Data about current status of vehicle warranties provided to AEC by the RFA.

2. In Mr. Drevna's written statement, he states that: "second generation renewable fuels have not materialized as the reality becomes clear that policymakers cannot mandate innovation or favorable economics." Do you agree with Mr. Drevna's statement? If not, why not? How is the RFS driving advanced biofuel innovation?

We do not agree with Mr. Drevna's written statement. First, second generation renewable fuels have materialized. The advanced biofuel industry produced enough fuel to meet the RFS advanced biofuel targets through 2013, and numerous independent reports demonstrate that the cellulosic biofuels industry is breaking through at commercial scale just six years after the enactment of RFS2 and notwithstanding the global recession.[25] Second, Mr. Drevna's statement ignores the fact that federal policy plays a central role in the development of new energy technologies, particularly with regard to fossil fuels. For example, the largest leaseholder in the Bakken told the Senate Finance Committee in 2012 that "[w]ithout the current capital [federal tax] provisions in place ... that let us keep our own money ... we would not have been able to fail over and over again, which is what it took to advance the technology needed to produce the Bakken and numerous other resource plays across America."[26] More broadly, the fossil fuels industry enjoys the benefit of a number of unique federal tax allowances – unavailable to renewable fuels – that de-risk and lower the cost of the ongoing development of oil and gas resources relative to other sources of liquid fuel. For example, a recent study estimates that fossil fuels received 70 percent of U.S. federal energy subsidies between 2002 and 2008, to the tune of more than $70 billion during this time period. [27] This number does not include the loopholes in oil and gas laws that, according to the Government Accountability Office (GAO), allowed petroleum companies to forego paying $53 billion in royalty payments, over just four years, for extracting natural resources from lands owned by the American taxpayer. The federal government also helps incumbent industries develop new technologies. According to a recent Congressional Research Service report, [f]or the period from 1948 through 2012, 11.6% of Department of Energy R&D spending went to renewables, 9.7 % to efficiency, 25% to fossil energy, and 49.3% to nuclear.[28] Finally, Mr. Drevna's statement ignores history. According to a recent report, "energy innovation has driven America's growth since before the 13 colonies came together to form the United States, and government support has driven that innovation for nearly as long."[29] Governmental support drove investment in coal, timber, engine innovations, land settlement for resource extraction and other forms of innovation in the 19th and 20th centuries, and domestic energy consumption and GDP have tracked closely for at least 200 years.[30]

3. Some of my colleagues believe removing the corn ethanol mandate, but keeping the advanced biofuel mandate in the RFS is the best way forward. Do you have concerns with this approach?

The AEC is strongly opposed to such an approach for a number of reasons. Most importantly, the proposal is proposing to do what is already done. The most recent production capacity data from EIA

[25] See AEC Progress Report: Cellulosic Biofuels at http://ethanolrfa.3cdn.net/96a2f9e04eb357bbbd_1sm6vadqk.pdf; Docket ID No. EPA-HQ-OAR-2012-0546: Regulation of Fuels and Fuel Additives: 2013 Renewable Fuel Standards; *Cellulosic Ethanol Heads for Cost-Competiveness by 2016, http://about.bnef.com/press-releases/cellulosic-ethanol-heads-for-cost-competitiveness-by-2016/;* Brown, T., Brown, R. "A review of cellulosic biofuel commercial-scale projects in the United States." Biofuels, Bioprod. Bioref. DOI:10.1002/bbb.1387 (2013); http://about.bnef.com/press-releases/cellulosic-ethanol-heads-for-cost-competitiveness-by-2016/.

[26] http://www.finance.senate.gov/imo/media/doc/Hamm%20Testimony1.pdf, p. 2.

[27] See http://www.elistore.org/Data/products/d19_07.pdf.

[28] See http://www.fas.org/sgp/crs/misc/RS22858.pdf

[29] See note 2, at p. 11.

[30] *Id.*

demonstrates that the corn ethanol industry has an annual capacity of roughly 14.5 billion gallons per year.[31] The RFS requirement for corn ethanol flat lines at 15 bgy in 2015, which means that the RFS is already an advanced biofuel policy going forward. And yet, opening up the RFS would have a number of counterproductive effects. First, it would leave the RFS open to other amendments that would be even more hostile than the one proposed. Supporters of pulling corn ethanol out of the program have suggested that they can control the politics, which we find questionable at best. Second, Congress established a trajectory for building a low carbon renewable fuel industry in the United States and investors have spent tens of billions of dollars answering the call. Changing course in the sixth year of a fifteen year policy will send a clear signal to the marketplace that Congress cannot be trusted to keep its commitment when it comes to energy policy. Looking at it another way, the propensity for the United States to change course on policy increases what investors call policy risk, which in turn drives investment to countries where the broader risk quotient (including policy) is less. It is far more productive for the American consumer and economy for Congress to keep its promises, especially those related to the very serious problem of foreign oil dependence. Third, it does not help the advanced biofuels industry to go after corn ethanol. There are more than 200 ethanol biorefineries in the United States today. They are currently displacing the need for marginal oil (e.g. tar sands, tight oil, etc.), which is the most carbon intensive fuel in the world. But these first generation ethanol refineries are also leading the charge, in many cases, to diversify their feedstock using cellulosic biomass. While not all advanced biofuel projects have ties to existing ethanol bio-refining and capital, a basic analysis of the industry demonstrates that a very large percentage in fact do have partnerships with incumbents. Finally, it is not clear to us that removing corn ethanol from the RFS will have the desired effect. For example, some have argued that removing support for corn-based fuel would help the livestock industry. We are perplexed by this argument. Corn prices are almost identical today as they were when the RFS2 was signed by President Bush. And yet, using less renewable fuel would increase crude oil prices – one of the biggest drivers of agricultural commodity (i.e. feed) price increases since 2007. Our view is very simple. If the goal is biofuel feedstock diversity and strong investment in new U.S. industries, the best strategy is to leave the policy alone and let it work, as designed.

4. **Many small and mid-range refineries do not have the capabilities to blend and must buy many or all of their RINs on the market. As a result, high and volatile RIN prices have had a large impact on these refineries. As the RFS continues, what can be done to assist these smaller refineries?**

Broadly speaking, and with regard to a policy that forces behavioral change in the marketplace to address a huge economic and environmental issue (oil dependence), there will be pressures on some parts of the marketplace. On the one hand, some merchant refiners are paying for RFS implementation via higher RIN prices. On the other hand, a decision to roll back the RFS too aggressively will undercut billions of dollars of investment in the advanced biofuels industry and jeopardize billions of dollars of federal support for advanced bio-refining via USDA and DOE loan guarantees and direct grants. For example, the USDA Biorefinery Assistance Program alone has dedicated more than $1b to the development of advanced biofuels. Recipients of loan guarantees must bring private capital to the table, and numerous companies have told the administration that this type of investment was frozen when the proposed RVO leaked in October 2013. As part of inquiry, it is also important to understand that some of these refineries are already helping themselves. For example, PBF Energy and Alon USA have told

[31] See http://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=M_EPOOXE_YNP_NUS_MBBL&f=M

analysts that they have new plans to blend more renewable fuels to take advantage of higher RIN prices.[32] Two other refineries of concern – PES and Monroe – do not appear to have made similar claims to analysts, but experts have noted that both refiners would be wise to follow PBF because both are in a potentially advantageous position given their access to rack distribution.[33] Advanced biofuel companies, on the other hand, rely on the RFS to break open a non-price driven market for their product. It is unclear how the industry will commercialize if the RFS contracts in the face of oil industry intransigence, but more than 35 leading advanced biofuel companies signed a letter to the President pointing out that the mere possibility of RIN markets not being allowed to work sends investment overseas.[34] We would look forward to working with you and EPA on a number of administrative strategies – in addition to the existing small refinery exemption – to alleviate unnecessary burden on small and mid-range refineries. A reasonable starting point is more transparency in RIN markets. While it is not clear what percentage of the 2013 spike in D6 RIN prices came as a result of the lack of transparency in RIN markets – either through hoarding from (blind) "shortage mentality" or more manipulative strategies – it is clear that a non-transparent RIN marketplace will continue to be a risk even if EPA softens the program in 2014 and removes all interest in buying RINs.[35] The best way to deal with this problem is work with the CFTC and/or EPA to provide more transparent and timely information about positions and trades, and perhaps controls on excessive behavior. This would protect smaller refineries from unforeseen circumstances, reduce the fiscal obligation of buying RINs, and allow current and future plans to invest in more ethanol storage/blending to come to fruition.

[32] See http://blogs.platts.com/2013/08/22/rins-moves/
[33] *Id.*at p. 3.
[34] See http://www.ethanolrfa.org/page/-/PDFs/AEC%2C%20BIO%20letter%20to%20POTUS%20on%202014%20RVOs.pdf?nocdn=1
[35] Numerous reports noted that during the week of February 3rd, PES made multiple "million RIN purchases" against what the market would suggest, which pushed RINs over 50 cents in follow-up trading.

Questions from Senator Cardin

1. **Does your organization represent biodiesel producers?**

The Advanced Ethanol Council (AEC) represents companies in the advanced ethanol sector, which includes cellulosic ethanol and other types of advanced ethanol sometimes not regarded to be cellulosic ethanol (e.g. municipal solid waste to ethanol). While some of our member companies are engaged in the biodiesel sector from a technological or other perspective, we represent the interests of the advanced and cellulosic ethanol industry.

2. **Does your organization represent, KiOr, the company that is regarded as having the only cellulosic biofuels plant producing any measurable amount of commercial cellulosic biofuel?**

KiOr is not a member of the AEC. KiOr makes renewable biomass into renewable crude oil (as opposed to finished renewable fuel) that qualifies under the RFS as cellulosic biofuel. As discussed, the AEC represents cellulosic and advanced ethanol. We certainly disagree with the notion that KiOR is the only commercial player in the space. We strongly encourage your office to download a copy of our progress report.[36] The report details the status of almost 20 cellulosic projects in the United States, and is being expanded and updated at this time. We would point your attention to a number of facilities that have completed construction and are coming online in 2014, including the Abengoa plant in Kansas, the DuPont plant in Iowa, and the POET-DSM plant in Iowa. There is also the INEOS trash-to-ethanol plant in Vero Beach that is already online. We would also point your attention to several plants in other countries – Enerkem's plant in Edmonton, Alberta, the Beta Renewables plant in Italy, several projects under construction in Brazil, etc. – as a testament to the fact that the industry is global in nature and the underlying value of the RFS is it drives these projects to the United States. It is true that we have not built out a multi-billion gallon domestic industry in the 6 years since the passage of RFS2. Financial markets were frozen for years and the economy is still not completely recovered. But it would be unfortunate to mistake delays in commercial deployment for a general failure to deploy. The industry is breaking through on multiple levels, and the RFS ensures that the U.S. leads the way.

3. **What is the Advanced Ethanol Council's relationship to the Renewable Fuels Association and the Fuels America Campaign?**

The AEC maintains a partnership with the RFA. We have a wide variety of common interests – including but not limited to allowing ethanol to compete with petroleum on a level playing field, promoting feedstock diversification in the ethanol industry, and making sure that the value of ethanol as a molecule is properly accounted for in a wide range of regulations and the marketplace – but the AEC maintains its own leadership, its own policy positions and is fiscally separate from the RFA. With regard to Fuels America, the AEC is a member of the coalition. Fuels America is a coalition formed to protect the most progressive, climate friendly alternative fuels policy ever passed by Congress.

[36] See http://ethanolrfa.org/page/-/PDFs/AEC%20Cellulosic%20Biofuels%20Industry%20Progress%20Report%202012-2013.pdf?nocdn=1

4. What percentage of the Fuels America campaigns funding comes from corn producers and the corn ethanol industry?

Unlike many groups in the fuel energy advocacy space, Fuels America is completely transparent about what they stand for and who they are. The AEC does not manage the campaign's funds, but from our count the clear majority of the funding comes from those promoting an advanced biofuel agenda. It might be worth noting that the funding for Fuels America mirrors the RFS itself, which requires a combination of first and second generation biofuels to be blended by 2022. In either case, the bright line often drawn for political reasons between corn ethanol and advanced biofuels is imaginary when it comes to the business world. Driving a wedge between first and second generation biofuels makes no more sense than driving a wedge between first and second generation wind, solar, or oil extraction for that matter. A basic analysis of the biofuel industry shows that most of the leading enzyme producers, for example, serve both existing and emerging markets. Many of today's corn ethanol facilities are leading the charge to adopt technologies to make ethanol from a wider range of feedstocks including wheat straw and other agricultural waste, and even algae and waste gases. They are doing so because it's in their self-interest to diversify feedstock and produce low carbon fuels to meet the RFS. It is not a coincidence that those trying to drive a wedge between first and second generation biofuels are often supported by or are otherwise tied to the oil industry; because, such a division weakens political support for the RFS and makes repeal of the program more likely. While opening the RFS to legislative change would be a good outcome for the oil industry, it would increase U.S. consumer dependence on oil and serve to export the advanced biofuel development opportunity to other countries. Some have also argued that RFS repeal – especially for corn-based products – would help the livestock industry. We are perplexed by this argument. Corn prices are almost identical today as they were when the RFS2 was signed by President Bush. And yet, using less renewable fuel would increase crude oil prices – one of the biggest drivers of agricultural commodity (i.e. feed) price increases since 2007. Either way, the current corn ethanol industry is already built out to meet the 15 bgy corn ethanol standard in the RFS. As we stated at the hearing, the RFS is an advanced biofuel policy going forward.

5. Do most of your member companies have ties to corn based biofuel production?

If you look back at the history of the AEC, you will find that the 10 companies that together founded the Council were very well diversified from a feedstock perspective but with notably very few ties to corn. We remain well diversified today. For example, one of the three elected AEC executive committee chairs is occupied by a trash-to-ethanol company. To fill out the picture, the AEC represents multiple trash-to-ethanol companies, a company making ethanol from algae, and multiple large international companies that are not relying on existing ethanol facilities to commercialize their fuel. That said, it is very common for innovators to partner with (or otherwise have ties to) incumbents when it comes to commercializing new technologies. This is evident among the companies with the AEC, which openly disclosed their business ties in the AEC Cellulosic Biofuel Progress Report.[37] It is also evident in other parts of the advanced biofuels industry. For example, it is our impression that nearly every company represented on the governing board of the Advanced Biofuels Association (ABFA) has a multinational oil company as a primary investor. We reject the premise (if made) that ties to incumbent industries – whether oil, ethanol or otherwise – should be construed to suggest an ulterior motive when it comes to policy

[37] See http://ethanolrfa.org/page/-/PDFs/AEC%20Cellulosic%20Biofuels%20Industry%20Progress%20Report%202012-2013.pdf?nocdn=1

positions. Many of the companies implicitly referenced are multi-billion dollar companies that have staked billions of dollars of investment in the development of cellulosic biofuels to meet the challenge set forth by Congress in 2007 via the RFS. Working with incumbents is the norm rather than the exception in our industry, especially in a marketplace as consolidated and monochromatic as motor fuels and in the context of a federal tax code that drives innovators to incumbents to finance plants.

6. **Does your organization agree with the statement made by the National Com Growers Association the cellulosic ethanol mandate, the National Com Growers Association compared supporters of cellulosic ethanol to parents who "tell stories about unicorns and fairies."**

The AEC does not agree with the statement, and the evidence (clearly shown in the AEC Progress Report cited previously) does not support the statement. Importantly, the NCGA issued a clarifying statement soon after the blog post was removed, saying, "[i]t is our policy that ethanol derived from materials other than corn starch, such as switchgrass, wood chips, corn stalks and corn fiber, etc. ... can be complementary to ethanol derived from corn." Clearly, the NCGA made a statement to be provocative that had to be clarified subsequently. Unfortunately, this is not uncommon in the political world.

7. **Do your members believe and support the statement made by Renewable Fuels Association President, Bob Dineen in the Wall Street Journal in July 2013, that "RINS are free"?**

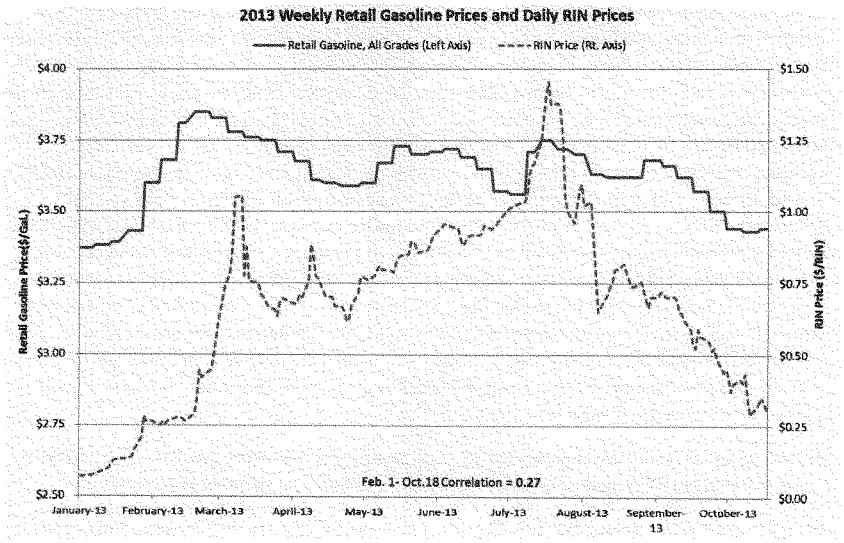
We support the statement. A RIN is an identification number generated when a gallon of RFS-qualifying renewable fuel is produced. The RIN is attached to the renewable fuel gallon at the point of sale to obligated parties (i.e. oil companies), but can be separated (from the liquid gallon) by obligated parties and sold for whatever price the market will bear. In simple terms, oil companies are free to sell (or not) any RIN that they acquire when they purchase a gallon of renewable fuel. Mr. Dinneen's statement refers to the fact that the obligated party gets a RIN for free when it buys a qualifying gallon of renewable fuel. So, for example, if 13 billion gallons of ethanol are sold into the marketplace in a given year then by statute 13 billion RINs also enter the marketplace free-of-charge with those gallons. That does not mean, of course, that RINs are free for those obligated parties who make the affirmative decision to comply with the RFS by buying RINs from other obligated parties instead of purchasing liquid gallons of renewable fuel. But the price of RIN cannot be considered a de-facto cost of compliance for two primary reasons: (a) it is other obligated parties/oil companies selling RINs and profiting from higher RIN prices;[38] and, (b) buying a RIN is, by definition, an alternative compliance mechanism entirely avoidable by simply buying liquid gallons of renewable fuel. To be clear, it is not the federal government or the ethanol industry that is selling the RIN – it is oil companies selling RINs to each other. We would also like to discuss two arguments related to RIN cost that are not supported by fact:

Argument 1: Oil industry accounting protocols require that each oil company must account for "potential RIN exposure" (i.e. a hypothetical in which they are forced to buy RINs as opposed to gallons to comply with the RFS); and therefore, RINs ore a de-facto cost of the program. This argument is invalid on its face. If an oil company wants to build an accounting hypothetical around the idea that it will have to buy RINs instead of liquid gallons to comply with the RFS, it is free to do so. But in the real world, there is more than enough qualifying conventional biofuel (i.e. the fuel

[38] See http://www.fuelsamerica.org/blog/entry/something-funny-about-those-oil-company-profits

relevant to the D6 RIN pool in question), and oil industry earnings calls demonstrate clearly that they are buying renewable fuel and selling RINs at a profit while oil industry trade associations claim that RINs are a de-facto cost of compliance.[39]

Argument 2: RINs are theoretically acquired for free, but are built into the price of ethanol. In theory, one could argue that a higher priced RIN could be an indirect cost of compliance if there is evidence that higher RIN prices are built into the cost of a gallon of ethanol (i.e. ethanol producers were fetching the price of the RIN via higher ethanol prices). But any basic analysis of the marketplace in 2013, when D6 RIN prices increased for the first time, demonstrates that the ethanol industry was not securing higher ethanol prices when RIN prices were high, and there was little to no correlation between RIN prices and ethanol prices. See below.



a. **Do you believe that most advanced biofuel producers share the point of view of Mr. Dineen?**

More than 35 advanced biofuel companies signed a letter to President Obama in October 2013 openly discussing the industry's position on RINs.[40] The letter is very clear that D6 RINs are free at the point of entry into the marketplace, and any value ascribed to RINs is created by obligated parties buying and selling in an open marketplace.

[39] See http://www.fuelsamerica.org/blog/entry/something-funny-about-those-oil-company-profits
[40] http://www.ethanolrfa.org/page/-/PDFs/AEC%2C%20BIO%20letter%20to%20POTUS%20on%202014%20RVOs.pdf?nocdn=1

8. Does your organization support replacing corn ethanol with advanced ethanol?

The purpose of the Energy Independence and Security Act of 2007 was to "increase the production of clean renewable fuels" in an effort to "move the United States toward greater energy independence and security." There is no evidence to suggest that the goal was to replace one domestically produced renewable fuel with another. The volumetric targets are additive rather than displacive when it comes to promoting renewable fuels, and replacing one domestic product with another would do little to move the United States toward greater energy independence. More broadly, the AEC supports the development of the opportunity for advanced ethanol fuels and technologies to compete with all types of liquid fuel, but particularly petroleum. Our industry needs the RFS to get a leg hold in the marketplace not because it has an inferior value proposition in comparison to gasoline, but instead because the market lacks the competitive, free market forces that would otherwise reward innovation. In a competitive marketplace, the increasing cost and scarcity of crude oil would play to the benefit of alternatives such as advanced biofuels. In this environment, if an innovator presents a valuable product for a competitive price, there is a reasonable expectation of demand. This free market principle gives investors a durable benchmark against which to judge the value of their product, which in turn attracts investment to better products. This important market dynamic is largely absent from the global liquid fuels marketplace for a number of reasons, including but not limited to the highly consolidated, vertically integrated characteristics of the oil industry, particularly with regard to wholesale markets, the anti-competitive price distorting behavior of OPEC, and blending constraints involving vehicle warranties. There is no better example of the consequence of this problem than ethanol, which has generally been offered at a significant discount to gasoline without increased demand significantly beyond the volume of fuel required for blending by the U.S. government. With specific regard to the advanced biofuels industry, if the market does not necessarily demand a better and cheaper product (by virtue of the absence of free market forces), then there is no impetus to create one. This is one of the primary reasons why the United States remains largely dependent on only one type of fuel (petroleum) to meet consumer demand for liquid fuels. It is also the overarching reason why U.S. government support for advanced biofuels is warranted and critical.

9. What impact would the litigation that Growth Energy and the Renewable Fuels Association are threatening to bring against EPA's proposed RVO have on your member organizations?

We are under the impression that both Growth Energy and the RFA are focused on addressing their concerns via the rulemaking process. But in the hypothetical, it is important to understand why the proposed RVO poses such a serious threat to the biofuels industry. As discussed, the RFS is essentially a mechanism to drive consumption in a vertically integrated, highly consolidated market that does not properly reward innovation. Because the oil industry controls off-take for any new type of liquid fuel, the RFS focuses on requiring oil companies to use increasing quantities of qualifying renewable fuel provided that it is available from a supply perspective and its use will not create severe economic harm. EPA has proposed to curtail the program not because of biofuel supply shortages or economic harm, but because of concerns that adequate biofuel supply may not get to market quickly enough to meet the legislated requirements for 2014. But if the RFS can be neutralized via limitations in distribution capacity, the oil industry (which largely controls distribution capacity) will simply create and perpetuate as many distribution capacity challenges as possible. As such, waiving the RFS based on concerns about

access to the marketplace invokes two things that will inflict serious damage on the advanced biofuel industry: (1) the inclusion of distribution capacity as part of EPA's waiver authority will introduce massive supply chain risk into every advanced biofuel investment by putting the year-to-year trajectory of the program in the hands of the oil industry; and, (2) curbing the program in the face of oil industry intransigence will signal to the investment marketplace (for all RIN pools) that when push comes to shove RINs will not be allowed to drive off-take opportunity, but instead will result in the curtailment of the program. Notably, adding distribution capacity to the RFS waiver language was at the top of the list for the oil industry when they were fighting to kill the RFS before passage. Biofuel trade associations have to consider lawsuit because this change of course by EPA, if memorialized in the final rule, will de-fang the RFS and drive advanced biofuel investment overseas. The current proposal has already frozen further development in the advanced biofuel industry. If the current proposal ends up in court, investment will remain frozen; markets for ethanol will not expand quickly enough to spur innovation; and, advanced biofuel companies with burn rates that cannot withstand a 3-4 year delay will face serious consequences in the immediate term. Many of these companies have the most innovative technologies in the world. While we would expect to win any legal challenge based on the clear meaning of the RFS waiver provision, there is no question that the legal uncertainty would hurt the advanced biofuel sector. But to be clear, the threat of lawsuit must be taken against the threat of a badly damaged program as represented by the proposed RVO. And we do not view the potential plaintiffs in the lawsuit, which very well could include advanced biofuel interests, as the catalysts for any unfortunate lawsuit that might occur. Either way, it is our objective at the AEC to avoid lawsuit and we believe we can.

Questions from Senator Gillibrand

1. **The advanced biofuel sector is comprised of multiple entities focused on movement of the sector. Like many emerging technology sectors, the industry is dependent on the federal government being decisive and consistent in its approach to advance biofuels. What challenges is the advanced biofuel production sector facing and what government support, including non-monetary, is needed to help surmount these challenges?**

With regard to the challenges faced by our industry, we face the normal set of investment risks encountered by most innovation industries in the world – technology risk, policy risk and market risk – but with the additional risk metrics created by two primary factors: (1) that we are endeavoring to produce fuel energy, which is capital intensive by definition; and, (2) we are a threat to a powerful incumbent industry that spends considerable resources trying to miscast our policies and fuels.

On the technology risk side, we are commercializing a technology that will produce the lowest carbon, most innovative fuels in the world. There is an inherent trial and error period that takes time and money to surmount. While we do not expect the federal government to resolve our technology risk for us, it is also true that the federal government provides far more assistance to those taking technology risk on the fossil fuel side than it does to those taking technology risk on the renewables side. For example, the federal tax code provides a number of permanent tax breaks to de-risk technological innovation for the extraction of fossil fuels that are unavailable to the renewable fuels sector. Referencing those tax breaks, the largest leaseholder in the Bakken told the Senate Finance Committee in 2012 that "[w]ithout the current capital [federal tax] provisions in place ... that let us keep our own money ... we would not have been able to fail over and over again, which is what it took to advance the technology needed to produce the Bakken and numerous other resource plays across America."[41] A recent study estimates that fossil fuels received 70 percent of U.S. federal energy subsidies between 2002 and 2008, to the tune of more than $70 billion during this time period.[42] This number does not include the loopholes in oil and gas laws that, according to the Government Accountability Office (GAO), allowed petroleum companies to forego paying $53 billion in royalty payments, over just four years, for extracting natural resources from lands owned by the American taxpayer. The federal government also helps incumbent industries develop new technologies. According to a recent Congressional Research Service report, [f]or the period from 1948 through 2012, 11.6% of Department of Energy R&D spending went to renewables, 9.7 % to efficiency, 25% to fossil energy, and 49.3% to nuclear.[43] As such, the first step toward helping the advanced biofuels emerge is to (at least) create parity in the federal tax code when it comes to the development of energy resources.

On the policy risk side, the answer is to protect the Renewable Fuel Standard (RFS). As discussed at length in our written testimony, the RFS is a tremendously valuable program from an energy policy perspective. In essence, the RFS has facilitated the emergence of a diverse new alternative fuel industry that produces a (liquid fuel) product that simultaneously: (a) reduces U.S. dependence on foreign oil; (b) reduces greenhouse gas emissions; (c) reduces gas prices and gives consumers a choice at the pump; (d) facilitates lower tailpipe combustion emissions; and, (5) creates new jobs and economic development

[41] http://www.finance.senate.gov/imo/media/doc/Hamm%20Testimony1.pdf, p. 2.
[42] See http://www.elistore.org/Data/products/d19_07.pdf.
[43] See http://www.fas.org/sgp/crs/misc/RS22858.pdf

opportunities across America. The oil industry is trying to repeal or weaken it legislatively because they enjoy an extremely lucrative, competition-free marketplace that is being changed at the fundamental level by the RFS. But their strategy is broader than just legislation. Their goal is to create a cloud of uncertainty around the program at all times, irrespective of the legislative process, to increase the perception of investment/policy risk for investors in the advanced biofuels industry. The advanced biofuels industry has the policy in place that it needs to blossom, but we need Congress to signal to the marketplace that it stands by the RFS. Importantly, supporting the RFS does not necessarily mean members of Congress have to be dogmatic in their support. It is a flexible program that can be adjusted by EPA to address some of the points of friction unintended by its administration. But the downside of failing to support the RFS is clear. The advanced biofuel opportunity will simply seek more stable policy environments in other countries.

On the market risk side, the root of the problem is the nature of the liquid fuel marketplace itself. As discussed in answers to questions from other members of the committee, global oil markets are collusively price-controlled by OPEC at the global level, and are extremely consolidated and vertically integrated domestically. The absence of free market forces in the liquid fuel marketplace are a problem for the advanced biofuels industry (and other innovators) because non-competitive markets do not properly facilitate and reward innovation. Non-price driven markets are almost impossible to predict with regard to future demand opportunity, because the market does not behave based on free market fundamentals and the creation of a better product does not necessarily translate into market demand. This lack of predictability increases investment risk – or makes risk impossible to assess – which in turns drives investment and potential strategic partners to other sectors. The RFS is essentially a mechanism to drive consumption in a broken marketplace, and solves this problem by providing a statutory (yet flexible) demand trajectory designed to spur off-take agreements (which are critical to project finance) between the incumbent oil industry and the advanced biofuels industry. As such, maintaining the RFS (which includes allowing higher RIN prices to change behavior in the oil industry) is the cornerstone of any effort by the federal government to help surmount the challenges faced by our industry in the marketplace. There are, however, additional regulatory hurdles that are currently inhibiting demand for advanced biofuels that need to be prioritized by EPA in order to facilitate the objectives of the RFS. The list includes providing equitable credit for renewable fuel use in the context of CAFE fuel efficiency standards, enforcing the prohibition against discouraging renewable fuel use at the retail gasoline level via franchise agreements with oil suppliers, properly accounting for the benefits of renewable fuel blending with regard to tailpipe emissions when it comes to Tier 3 and related regulations, and addressing indefensible incongruities in fuel regulations when it comes to biofuel blending (e.g. the different treatment of E10 and E15 blends when it comes to vapor pressure).

The AEC would look forward to the opportunity to work with your office on addressing many of these issues to ensure that next generation biofuels are developed in the United States.

Questions from Senator Vitter

1. **Assuming EPA's waiver methodology is in place annually, if you had your choice between status quo or making reforms to the program, which would you choose?**

We expect EPA to make critical changes to the final 2014 RVO that will put the program back on course. But in the hypothetical, we would continue to choose options outside of legislative change to ensure that the program achieves the objective of promoting clean renewable fuels. The threat of annual ambiguity from EPA – in the event that we are unable to change their minds – must always be taken against the risk that investors will simply spend their money elsewhere if Congress changes its mind just 6 years into a 15-year energy program. It is ironic that while Congress and the American public continue to voice their concern over the exportation of jobs and capital to other countries, parts of Congress continue to push policies (e.g. changing the rules re: the RFS in midstream) that would do just that. The AEC would look forward to the opportunity to work with your office on improving the RFS administratively to avoid watching the economic opportunity offered by the development of advanced biofuels pass to other nations.

2. **Mr. Coleman, because EPA is proposing to basically freeze ethanol consumption at 2012 and 2013 levels, Iowa state economists project that the EPA's action will have little impact. The cellulosic mandate is being more than doubled from 6 million gallons to 17 million gallons. From where do your predictions of plant closures and layoffs come?**

While we are not clear which predictions or impacts you are citing, we would like to offer the following response.

There are two major issues with the proposed RVO: (1) the actual volume of fuel required for use; and, (2) the effect of the proposal on the mechanics/fundamentals of the program. It is true that the 17 million gallon target for cellulosic biofuel represents an increase from prior years, but the fundamentals of the RFS are so weakened by the proposed RVO that the program will cease to facilitate the rapid commercialization of cellulosic biofuels over and above 17 million gallons.

As discussed in answers to other questions, the root of the problem is the lack of competition in the global liquid fuel marketplace. Global oil markets are collusively price-controlled by OPEC at the global level, and are extremely consolidated and vertically integrated domestically. The absence of free market forces in the liquid fuel marketplace are a problem for the advanced biofuels industry (and other innovators) because non-competitive markets do not properly facilitate and reward innovation. Non-price driven markets are almost impossible to predict with regard to future demand opportunity, because the market does not behave based on free market fundamentals and the creation of a better product does not necessarily translate into market demand. This lack of predictability increases investment risk – or makes risk impossible to assess – which in turns drives investment and potential strategic partners to other sectors. The RFS is essentially a mechanism to drive consumption in a broken marketplace. As discussed elsewhere, because the oil industry controls off-take for any new type of liquid fuel, the RFS focuses on requiring oil companies to use increasing quantities of qualifying renewable fuel provided that it is available from a supply perspective and its use will not create severe economic harm. EPA has proposed to curtail the program not because of biofuel supply shortages or

economic harm, but because of concerns that adequate biofuel supply may not get to market quickly enough to meet the legislated requirements for 2014. But if the RFS can be neutralized via limitations in distribution capacity, the oil industry (which largely controls distribution capacity) will simply create and perpetuate as many distribution capacity challenges as possible. As such, waiving the RFS based on concerns about access to the marketplace invokes two things that will inflict serious damage on the advanced biofuel industry: (1) the inclusion of distribution capacity as part of EPA's waiver authority will introduce massive supply chain risk into every advanced biofuel investment by putting the year-to-year trajectory of the program in the hands of the oil industry; and, (2) curbing the program in the face of oil industry intransigence will signal to the investment marketplace (for all RIN pools) that when push comes to shove RINs will not be allowed to drive off-take opportunity, but instead will result in the curtailment of the program. So while the 2014 cellulosic biofuel target grows the market in a limited sense, it would be very difficult to argue that putting the trajectory of the program in the hands of our primary competitor would not have a profoundly negative effect on the development of the U.S. renewable fuels industry.

Thank you for the opportunity to answer these questions.

Senator BOXER. Thank you, sir.

So, I will start. Mr. Drevna, under current law, there is no limit on the rate of increase in the alternative fuels requirement up to the target. You probably know that. I am not asking a question, I am just stating fact. And I believe setting such a limit, which was proposed by one of the members of this panel, would be a disincentive to development of new technologies. And the first panel agreed with that. And I want to turn to my questions—Mr. Holzfaster, what percentage of ethanol is blended into the fuel you use in your farming equipment?

Mr. HOLZFASTER. Currently the fuel that we have delivered to our farm is delivered at a 30 percent blend.

Senator BOXER. Thirty percent blend. Has the use of this level of ethanol caused any engine or performance problems in your equipment?

Mr. HOLZFASTER. It has not.

Senator BOXER. None at all?

Mr. HOLZFASTER. None at all.

Senator BOXER. OK. And Mr. Holzfaster, in your testimony you briefly described the positive economic impacts on your community resulting from the RFS Program. Would you describe a little bit more what it is like where you live and how the RFS has helped your community and other rural communities across this country?

Mr. HOLZFASTER. I live in a rural community. The small town of Paxton that I come from has less than 570 people when everybody is home.

Senator BOXER. We have that on my street.

[Laughter.]

Senator BOXER. I understand.

Mr. HOLZFASTER. The certainty that the RFS has provided to the commodity markets has allowed confidence in production. Right now, at the close of market yesterday, corn prices were below my cost of production. That takes away a lot of the confidence and security that otherwise I would have to proceed to the following year.

I have friends and neighbors who, unlike a few years ago, say their families now drive safe, reliable vehicles. A neighbor whose kids that are in high school can now say yes, I am going to college. Otherwise, in a rural area, you would say well, we will see what the corn market does. That confidence is there with the current RFS.

Senator BOXER. So, it is fair to say you see prosperity moving into your community because of this?

Mr. HOLZFASTER. Yes, that would be fair. Prosperity is a strong word but at least security.

Senator BOXER. Better hope? Is that a better way to put it? More hope?

Mr. HOLZFASTER. Absolutely. Absolutely.

Senator BOXER. More hope. OK.

I wanted to point out, because I am going to yield back, that other environmental organizations do support the current RFS including the NRDC, the Union of Concerned Scientists. But I would say, Mr. Faber, I was pleased that you would say your problem is particularly with the impact of the corn ethanol on the environ-

ment. Is that fair to say? But you are supporting the development of these other alternative fuels, the non-food source? Is that fair?

Mr. FABER. That is right, Chairman Boxer. Our big challenge is there simply is a limited pool because of the constraints on engines and infrastructure for ethanol. And I think we are all anxious to see second generation ethanol reach the marketplace.

Senator BOXER. I understand.

Mr. FABER. Right now, that marketplace is completely saturated by conventional corn ethanol.

Senator BOXER. So you would not repeal the whole thing, but you would alter it?

Mr. FABER. I think that there are certainly reforms that we can make that give the second generation of fuels a foothold in the pool for, with corn ethanol. Absolutely.

Senator BOXER. OK. Thank you. I would yield back and ask Senator Vitter for his time.

Senator VITTER. Thank you, Madam Chair. I am going to ask one quick question and then reserve my time and let Senator Inhofe go because he has some pressing items on his schedule.

But my very quick question, and I will not get off topic, is just to ask General Clark. We have had a discussion about another public policy issue and I repeated a question to you in a letter yesterday which you had committed to answer in our conversation on October 8. And so the simple question is, do you plan on answering that question?

General CLARK. I am very happy to answer that question. I have not been paid to go down to Louisiana. I went down there to talk about Lifeline phones because over 36,000 veterans in the State of Louisiana are dependent on those phones for telephone communication. Those phones are not paid for by the U.S. Government. They are not a rip-off of the taxpayer.

Senator BOXER. Why are we talking about people going to talk about phones? What is this? This is not the Commerce Committee.

Senator VITTER. I was not trying to get off topic.

Senator BOXER. Well, you got off topic.

Senator VITTER. Will you be answering the full question in writing?

Senator BOXER. I am not, may I just say, as Chairman of this Committee, I give people a lot of leeway. We are not going to attack panelists on other issues.

Senator VITTER. I am not——

Senator BOXER. Period. End of quote. If you want to do it, have a press conference.

Senator VITTER. I will take that as a yes, so I look forward to your full answer in writing. With that, I will reserve the rest of my time and let Jim Inhofe go because of his schedule.

Senator INHOFE. Thank you very much, both of you, and I appreciate it.

General Clark, you and I have known each other for a long time. Actually, we have been friends even though we have disagreed. But I have to say that I was very impressed with the comments you made at the beginning, particularly when you said that we need to produce as much domestic oil as possible, looking at it from a national security perspective.

So, for the record, now there is not time to give the answer now, don't you think a good way to increase that production, domestic production, would be to go into the Federal public lands for expiration? I will wait, just to get that for the record.

I have two questions for Mr. Drevna. Mr. Drevna, first of all, thanks for redeeming me on my cap and trade statement. Right now, we have gas stations all over my State. Stick that up again, will you? And I am asked everywhere I go, it seems like it is unanimous. They all crowd into these places and I am really concerned about it because I get the question from the people in Oklahoma as to, you know, is under this RFS system, the way that it is divided up, what kind of assurance would there be that in my State of Oklahoma that we would be able to continue just at the current rate of selling clear gas? Do you have any thoughts about that?

Mr. DREVNA. Senator Inhofe, yes. That is one of the reasons why we specifically in our waiver request to the EPA on the 2014 RVOs that we had suggested that they even go a little bit lower because, yes, in order to provide the clear gasoline. And by no means is Oklahoma the only State who wants E0 clean gasoline as was mentioned earlier in the opening statements for boats, et cetera.

So, we want that a little bit lower to give it a little bit more fluidity into the system. Our position is that if EPA errs a little bit on the low side of the ethanol mandate for 2014, no harm, no foul because we will be blending that amount anyway. If they err on the high side, then we are going to find ourselves back in that same position that we were in the late spring, early summer of 2013 where the RIN prices, which are not free, went through the roof.

So, what we are saying is that we need that fluidity. The other problem with providing E0 to everybody is that even with E0, we are still required to find a RIN for that particular gallon of gasoline. So, we have to offset it by going somewhere else. That is why we need that extra cushion. We applaud EPA for acknowledging the blend wall but we believe that they have to go a little bit further.

Senator INHOFE. Maybe for the record you can give me a little simpler response that I can tell them when they ask the question in Oklahoma. And it is something of great concern. One more question.

A lot of people are characterizing the oil and gas industry as monopolistic. I think it is really important that we realize the industry, I am going to make a statement and see if you agree with it, the oil industry has invested more on alternative fuel research and development than the entire renewable sector and the Federal Government combined. Now, a lot of that has taken place in our beautiful little city of Bartlesville, Oklahoma. When you are faced with this accusation of a monopolistic, what is your response?

Mr. DREVNA. Well, as you said so accurately, we have invested as an industry more than anyone else as far as the advanced biofuels. The question is, are products monopolistic or are companies monopolistic? The product is gasoline and diesel. That is what we sell. How can we, we do not control the gas stations who sell the gasoline. We have franchisees. About 50 percent of the ownership of gas stations are franchisors who have contracts with the folks. The other 50 percent, or more than 50 percent, are inde-

pendent, you know, non-branded. They do not want to put the infrastructure in at upwards of $200,000 a station to sell a product that no one wants.

Senator BOXER. Thank you. Well, we are going to put into the record the poor oil companies' profits for the third quarter. The five big ones, two of which are not American companies, earned $23.1 billion. So somehow I guess you can manage to spend a few bucks on the RINs.

Mr. DREVNA. Madam Chair, it is not the question of spending dollars on RINs. It is how much we can put into the system and keep the American consumer——

Senator BOXER. I understand. You just complained about the price of the RINs, but maybe I heard you wrong. You did talk about the price of the RINs. But we are going to move forward here, and next we are going to have Senator Cardin.

[The referenced documents follow:]

Supplementary Information

The information below has been provided to enhance understanding of the terminology and performance measures that have been used in the accompanying presentations.

Group measures

Replacement cost profit, underlying replacement cost profit and underlying business replacement cost profit

Replacement cost (RC) profit or loss reflects the replacement cost of supplies and is arrived at by excluding from profit or loss inventory holding gains and losses and their associated tax effect. RC profit or loss for the group is not a recognized GAAP measure.

Underlying RC profit is replacement cost profit or loss adjusted for non-operating items and fair value accounting effects. Underlying business RC profit is underlying RC profit or loss adjusted to exclude the results of the TNK-BP and Rosneft segments and the group consolidation adjustment that arises due to the in-period change in the value of unrealized profit in inventory. Underlying RC profit, fair value accounting effects and underlying business RC profit are not recognized GAAP measures.

Reconciliation of profit (loss) before interest and tax for the group to underlying replacement cost profit attributable to BP shareholders

$million

Total Group	Q1	Q2	Q3	Q4	2012	Q1	Q2	Q3	Q4	2013
Profit (loss) before interest and tax	9,161	(1,599)	8,440	3,767	19,769	20,138	4,485	5,569	-	30,192
Inventory holding (gains) losses	(1,437)	2,324	(1,059)	766	594	(406)	506	(444)	-	(344)
Replacement cost profit before interest and tax	7,724	725	7,381	4,533	20,363	19,732	4,991	5,125	-	29,848
Less non-operating items:										
- Gulf of Mexico oil spill response	30	(843)	(56)	(4,126)	(4,995)	(22)	(199)	(30)	-	(251)
- Other non-operating items	387	(4,155)	(334)	3,567	(535)	12,433	(315)	(686)	-	11,430
	417	(4,998)	(390)	(559)	(5,530)	12,411	(514)	(716)	-	11,179
Less fair value accounting effects	(95)	(180)	(261)	(25)	(561)	(73)	107	14	-	48
Underlying replacement cost profit before interest and tax	7,402	5,903	8,032	5,117	26,454	7,394	5,398	5,829	-	18,621
Finance costs and net finance income (expense) relating to pensions and other post-retirement benefits	(405)	(390)	(378)	(487)	(1,638)	(404)	(389)	(397)	-	(1,170)
Less Finance costs relating to Gulf of Mexico oil spill response	(6)	(4)	(3)	(6)	(19)	(10)	(10)	(9)	-	(29)
	(399)	(386)	(373)	(481)	(1,619)	(394)	(379)	(388)	-	(1,141)
Taxation on an underlying replacement cost basis	(2,291)	(1,921)	(2,576)	(742)	(7,530)	(2,706)	(2,243)	(1,661)	-	(6,610)
Non-controlling interests	(61)	(45)	(66)	(62)	(234)	(79)	(84)	(88)	-	(251)
Underlying replacement cost profit attributable to BP shareholders	4,651	3,551	5,017	3,852	17,071	4,215	2,712	3,692	-	10,619

Reconciliation of replacement cost profit (loss) before interest and tax for segments to underlying replacement cost profit (loss) before interest and tax

$million

	Q1	Q2	Q3	Q4	2012	Q1	Q2	Q3	Q4	2013
Upstream										
Replacement cost profit before interest and tax	6,983	2,913	4,907	7,688	22,491	5,562	4,400	4,158	-	14,120
Less non-operating items	822	(1,495)	516	3,348	3,189	(60)	143	(226)	-	(143)
Less fair value accounting effects	(133)	7	25	(39)	(140)	(60)	(31)	(39)	-	(130)
Underlying replacement cost profit before interest and tax	6,294	4,401	4,366	4,379	19,436	5,702	4,288	4,423	-	14,413
Downstream										
Replacement cost profit (loss) before interest and tax	859	(1,732)	2,408	1,329	2,864	1,647	1,016	616	-	3,279
Less non-operating items	(106)	(2,678)	(315)	(73)	(3,172)	19	(323)	(157)	-	(461)
Less fair value accounting effects	38	(187)	(296)	8	(427)	(13)	138	53	-	178
Underlying replacement cost profit before interest and tax	927	1,133	3,009	1,394	6,463	1,641	1,201	720	-	3,562
TNK-BP										
Replacement cost profit before interest and tax	1,064	452	1,282	575	3,373	12,500	-	-	-	12,500
Less non-operating items	(93)	-	(12)	351	246	12,500	-	-	-	12,500
Less fair value accounting effects	-	-	-	-	-	-	-	-	-	-
Underlying replacement cost profit before interest and tax	1,157	452	1,294	224	3,127	-	-	-	-	-
Rosneft										
Replacement cost profit before interest and tax[a]	-	-	-	-	-	85	218	792	-	1,095
Less non-operating items	-	-	-	-	-	-	-	(16)	-	(16)
Less fair value accounting effects	-	-	-	-	-	-	-	-	-	-
Underlying replacement cost profit before interest and tax	-	-	-	-	-	85	218	808	-	1,111
Other businesses and corporate										
Replacement cost profit (loss) before interest and tax	(671)	(522)	(1,096)	(505)	(2,794)	(467)	(573)	(674)	-	(1,714)
Less non-operating items	(236)	18	(523)	(57)	(798)	(6)	(135)	(289)	-	(430)
Less fair value accounting effects	-	-	-	-	-	-	-	-	-	-
Underlying replacement cost profit (loss) before interest and tax	(435)	(540)	(573)	(448)	(1,996)	(461)	(438)	(385)	-	(1,284)

[a] Second quarter 2013 as reported includes an amendment to first-quarter profit, which was reported based on a BP estimate.

Inventory holding gains and losses

Inventory holding gains and losses represent the difference between the cost of sales calculated using the average cost to BP of supplies acquired during the period and the cost of sales calculated on the first-in first-out (FIFO) method after adjusting for any changes in provisions where the net realizable value of the inventory is lower than its cost. Under the FIFO method, which we use for IFRS reporting, the cost of inventory charged to the income statement is based on its historic cost of purchase, or manufacture, rather than its replacement cost. In volatile energy markets, this can have a significant distorting effect on reported income. The amounts disclosed represent the difference between the charge (to the income statement) for inventory on a FIFO basis (after adjusting for any related movements in net realizable value provisions) and the charge that would have arisen if an average cost of supplies was used for the period. For this purpose, the average cost of supplies during the period is principally calculated on a monthly basis by dividing the total cost of inventory acquired in the period by the number of barrels acquired. The amounts disclosed are not separately reflected in the financial statements as a gain or loss. No adjustment is made in respect of the cost of inventories held as part of a trading position and certain other temporary inventory positions.

Management believes this information is useful to illustrate to investors the fact that crude oil and product prices can vary significantly from period to period and that the impact on our reported result under IFRS can be significant. Inventory holding gains and losses vary from period to period due principally to changes in oil prices as well as changes to underlying inventory levels. In order for investors to understand the operating performance of the group excluding the impact of oil price changes on the replacement of inventories, and to make comparisons of operating performance between reporting periods, BP's management believes it is helpful to disclose this information.

Non-operating items

Non-operating items are charges and credits arising in consolidated entities and in TNK-BP and Rosneft that are included in the financial statements and that BP discloses separately because it considers such disclosures to be meaningful and relevant to investors. They include all charges and credits relating to the Gulf of Mexico oil spill. They are items that management considers not to be part of underlying business operations and are disclosed in order to enable investors better to understand and evaluate the group's reported financial performance.

Fair value accounting effects

Fair value accounting effects are defined on page 19 of our third-quarter 2013 results announcement. A reconciliation to GAAP information is set out below:

										$million
	Q1	Q2	Q3	Q4	2012	Q1	Q2	Q3	Q4	2013
Upstream										
Replacement cost profit before interest and tax adjusted for fair value accounting effects	7,116	2,906	4,882	7,721	22,625	5,622	4,431	4,197	-	14,250
Impact of fair value accounting effects	(133)	7	25	(33)	(134)	(60)	(31)	(39)	-	(130)
Replacement cost profit before interest and tax	6,983	2,913	4,907	7,688	22,491	5,562	4,400	4,158	-	14,120
Downstream										
Replacement cost profit (loss) before interest and tax adjusted for fair value accounting effects	821	(1,545)	2,694	1,321	3,291	1,660	878	563	-	3,101
Impact of fair value accounting effects	38	(187)	(286)	8	(427)	(13)	138	53	-	178
Replacement cost profit (loss) before interest and tax	859	(1,732)	2,408	1,329	2,864	1,647	1,016	616	-	3,279
Total group										
Profit (loss) before interest and tax adjusted for fair value accounting effects	9,256	(1,419)	8,701	3,792	20,330	20,211	4,378	5,555	-	30,144
Impact of fair value accounting effects	(95)	(180)	(261)	(25)	(561)	(73)	107	14	-	48
Profit (loss) before interest and tax	9,161	(1,599)	8,440	3,767	19,769	20,138	4,485	5,569	-	30,192

Net debt – Ratio of net debt (finance debt, including the fair value of associated derivative financial instruments that are used to hedge foreign exchange and interest rate risks relating to finance debt, for which hedge accounting is claimed, less cash and cash equivalents) to net debt plus equity.

The table below presents BP's Debt to Debt plus Equity ratio on a gross basis as net debt is not a recognized GAAP measure:

$ million, except ratios

	2012				2013			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Gross debt	46,471	47,647	49,071	48,800	46,425	46,990	50,284	-
Less: fair value asset (liability) of hedges related to finance debt	1,224	1,067	1,572	1,700	1,083	460	734	-
	45,247	46,580	47,499	47,100	45,342	46,530	49,550	-
Less: Cash and cash equivalents	14,267	15,075	16,174	19,635	27,679	28,313	29,499	-
Net debt	30,980	31,505	31,325	27,465	17,663	18,217	20,051	-
Equity	119,315	113,415	118,883	119,752	131,085	130,133	131,251	-
Gross debt to gross debt-plus-equity ratio	28.0%	29.6%	29.2%	29.0%	26.2%	26.5%	27.7%	-
Net debt to net debt-plus-equity ratio	20.6%	21.7%	20.9%	18.7%	11.9%	12.3%	13.3%	-

Free cash flow
Net cash provided by operating activities plus net cash provided by investing activities.

Inorganic capital expenditure (Inorganic Capex) is equal to acquisitions, asset exchanges and certain other inorganic capital expenditure. See page 16 of our third-quarter 2013 results announcement.

Organic capital expenditure (Organic Capex) is equal to total capital expenditure and acquisitions less inorganic capital expenditure.

Operating capital employed – total assets (excluding goodwill) less total liabilities, excluding finance debt and current and deferred taxation. BP publishes segment results on a pre-tax basis and publishes operating capital employed for each segment.

Operating cash flow
The terms 'operating cash', 'operating cash flow' and 'operating cash margin' are defined as 'net cash provided by (used in) operating activities' as stated in the condensed group cash flow statement. When used in the context of a segment rather than the group, the terms refer to the segment's share thereof.

Policy, Government and Public Affairs
Chevron Corporation
P.O. Box 6078
San Ramon, CA 94583-0778
www.chevron.com

News Release

FOR RELEASE AT 5:30 AM PDT
NOVEMBER 1, 2013

Chevron Reports Third Quarter Net Income of $5.0 Billion

SAN RAMON, Calif., November 1, 2013 – Chevron Corporation (NYSE: CVX) today reported earnings of $5.0 billion ($2.57 per share – diluted) for the third quarter 2013, compared with $5.3 billion ($2.69 per share – diluted) in the 2012 third quarter.

Sales and other operating revenues in the third quarter 2013 were $57 billion, compared to $56 billion in the year-ago period.

Earnings Summary

	Three Months Ended Sept. 30		Nine Months Ended Sept. 30	
Millions of dollars	**2013**	**2012**	**2013**	**2012**
Earnings by Business Segment				
Upstream	$5,092	$5,139	$15,957	$16,930
Downstream	380	689	1,847	3,374
All Other	(522)	(575)	(1,311)	(1,370)
Total [1][2]	**$4,950**	**$5,253**	**$16,493**	**$18,934**
[1] *Includes foreign currency effects*	*$(276)*	*$(293)*	*$272*	*$(323)*

[2] *Net income attributable to Chevron Corporation (See Attachment 1)*

"Our third quarter earnings were down from a year ago," said Chairman and CEO John Watson, "primarily reflecting lower margins for refined products in the current period."

"We continue to make good progress on our major capital projects," Watson added. "Construction continues, and important milestones are being reached, on our Gorgon and Wheatstone LNG projects in Australia. Important interim construction goals have been recently reached for our Jack/St. Malo and Big Foot deepwater projects in the Gulf of Mexico, in preparation for their project start-ups scheduled for late 2014. We are also moving forward on the development of our liquids-rich unconventional properties in the United States."

Recent upstream highlights include:

- *Australia* – Signed binding long-term Sales and Purchase Agreements with Tohoku Electric Power Company, Inc. for Wheatstone LNG. Binding long-term agreements now cover 85 percent of Chevron's equity LNG offtake from Wheatstone.

- *Australia* – Acquired exploration interests in two blocks located in the deepwater Bight Basin offshore South Australia.
- *Canada* – Successfully concluded the initial twelve-well exploration drilling program in the liquids-rich portion of the Duvernay Shale.

"In the downstream business, we continued to advance our growth investments," said Watson. Chevron Phillips Chemical Company LLC, the company's 50 percent-owned affiliate, announced a final investment decision on its U.S. Gulf Coast Petrochemicals Project. This project will include an ethane cracker with an annual design capacity of 1.5 million metric tons per year and two polyethylene facilities, each with an annual design capacity of 500,000 metric tons per year.

The company purchased $1.25 billion of its common stock in the third quarter 2013 under its share repurchase program.

UPSTREAM

Worldwide net oil-equivalent production was 2.59 million barrels per day in the third quarter 2013, up from 2.52 million barrels per day in the 2012 third quarter. The increase was primarily driven by lower maintenance-related downtime at Tengizchevroil and project ramp-ups in the United States, Nigeria and Angola, partially offset by normal field declines.

U.S. Upstream

	Three Months Ended Sept. 30		Nine Months Ended Sept. 30	
Millions of Dollars	**2013**	**2012**	**2013**	**2012**
Earnings	$1,026	$1,122	$3,241	$3,969

U.S. upstream earnings of $1.03 billion in the third quarter 2013 were down $96 million from a year earlier, as higher crude oil and natural gas realizations and increased production were more than offset by higher depreciation, exploration and operating expenses.

The company's average sales price per barrel of crude oil and natural gas liquids was $97 in the third quarter 2013, up from $91 a year ago. The average sales price of natural gas was $3.23 per thousand cubic feet, compared with $2.63 in last year's third quarter.

Net oil-equivalent production of 655,000 barrels per day in the third quarter 2013 was up 18,000 barrels per day, or 3 percent, from a year earlier. Production increases in the Delaware Basin in New Mexico and the Marcellus Shale in western Pennsylvania, along with the absence of weather-related downtime in the Gulf of Mexico, were partially offset by normal field declines elsewhere. The net liquids component of oil-equivalent production increased 2 percent in the 2013 third quarter to 448,000 barrels per day, while net natural gas production increased 5 percent to 1.24 billion cubic feet per day.

International Upstream

Millions of Dollars	Three Months Ended Sept. 30		Nine Months Ended Sept. 30	
	2013	**2012**	**2013**	**2012**
Earnings*	$4,066	$4,017	$12,716	$12,961
**Includes foreign currency effects*	*$(188)*	*$ (252)*	*$259*	*$ (241)*

International upstream earnings of $4.07 billion increased $49 million from the third quarter 2012. The increase between quarters was primarily due to higher volumes and realizations for crude oil, largely offset by the absence of a 2012 gain of approximately $600 million from the sale of an equity interest in the Wheatstone Project, and higher operating expenses in the current period. Foreign currency effects decreased earnings by $188 million in the 2013 quarter, compared with a decrease of $252 million a year earlier.

The average sales price for crude oil and natural gas liquids in the third quarter 2013 was $104 per barrel, up from $98 a year earlier. The average price of natural gas was $5.88 per thousand cubic feet, compared with $6.03 in last year's third quarter.

Net oil-equivalent production of 1.93 million barrels per day in the third quarter 2013 was up 51,000 barrels per day, or 3 percent, from a year ago. Production increased primarily due to lower maintenance-related downtime at Tengizchevroil and project ramp-ups in Nigeria and Angola, partially offset by normal field declines. The net liquids component of oil-equivalent production increased 2 percent to 1.28 million barrels per day, while net natural gas production increased 3 percent to 3.91 billion cubic feet per day.

DOWNSTREAM

U.S. Downstream

Millions of Dollars	Three Months Ended Sept. 30		Nine Months Ended Sept. 30	
	2013	**2012**	**2013**	**2012**
Earnings	$249	$456	$522	$1,717

U.S. downstream operations earned $249 million in the third quarter 2013 compared with earnings of $456 million a year earlier. The decrease was mainly due to lower margins on refined product sales and higher operating expenses reflecting repair and maintenance activities at company refineries. The decrease was partially offset by higher earnings from the 50 percent-owned Chevron Phillips Chemical Company LLC.

Refinery crude oil input of 831,000 barrels per day in the third quarter 2013 increased 52,000 barrels per day from the year-ago period. The increase was primarily due to the absence of effects of an August 2012 incident at the refinery in Richmond, California that shut down the crude unit, partially offset by planned maintenance activities at the refinery in El Segundo, California in the current period.

Refined product sales of 1.19 million barrels per day were up 12,000 barrels per day from the third quarter 2012, mainly reflecting higher gasoline sales. Branded gasoline sales increased 2 percent to 529,000 barrels per day.

International Downstream

	Three Months Ended Sept. 30		Nine Months Ended Sept. 30	
Millions of Dollars	**2013**	**2012**	**2013**	**2012**
Earnings*	$131	$233	$1,325	$1,657
**Includes foreign currency effects*	*$(86)*	*$(43)*	*$20*	*$(76)*

International downstream operations earned $131 million in the third quarter 2013 compared with $233 million a year earlier. Current quarter earnings decreased due to lower margins on refined product sales, partially offset by a favorable change in effects on derivative instruments. Foreign currency effects decreased earnings by $86 million in the 2013 quarter, compared with a decrease of $43 million a year earlier.

Refinery crude oil input of 885,000 barrels per day in the third quarter 2013 decreased 24,000 barrels per day from the year-ago period. Total refined product sales of 1.56 million barrels per day in the 2013 third quarter were essentially flat with the year-ago period.

ALL OTHER

	Three Months Ended Sept. 30		Nine Months Ended Sept. 30	
Millions of Dollars	**2013**	**2012**	**2013**	**2012**
Net Charges*	$(522)	$(575)	$(1,311)	$(1,370)
Includes foreign currency effects	*$(2)*	*$2*	*$(7)*	*$ (6)*

All Other consists of mining operations, power generation businesses, worldwide cash management and debt financing activities, corporate administrative functions, insurance operations, real estate activities, energy services, alternative fuels, and technology companies.

Net charges in the third quarter 2013 were $522 million, compared with $575 million in the year-ago period. The change between periods was mainly due to lower employee compensation and benefits expenses and other corporate charges, partially offset by an impairment of a power-related equity affiliate.

CAPITAL AND EXPLORATORY EXPENDITURES

Capital and exploratory expenditures in the first nine months of 2013 were $28.9 billion, compared with $22.7 billion in the corresponding 2012 period. The amounts included $1.8 billion in 2013 and $1.4 billion in 2012 for the company's share of expenditures by affiliates, which did not require cash outlays by the company. Capital expenditures increased between periods as work progressed on a number of major capital projects, particularly two Australian LNG projects and two deepwater Gulf of Mexico

projects. In addition, the company acquired new resource opportunities in Australia, the Permian Basin and the Kurdistan Region of Iraq, along with interests in the Kitimat LNG Project in Canada. Expenditures for upstream represented 92 percent of the companywide total in the first nine months of 2013.

# # #

NOTICE

Chevron's discussion of third quarter 2013 earnings with security analysts will take place on Friday, November 1, 2013, at 8:00 a.m. PDT. A webcast of the meeting will be available in a listen-only mode to individual investors, media, and other interested parties on Chevron's Web site at www.chevron.com under the "Investors" section. Additional financial and operating information will be contained in the Earnings Supplement that will be available under "Events and Presentations" in the "Investors" section on the Web site.

Chevron will post selected fourth quarter 2013 interim performance data for the company and industry on its Web site on Thursday, January 9, 2014, at 2:00 p.m. PST. Interested parties may view this interim data at www.chevron.com under the "Investors" section.

CAUTIONARY STATEMENTS RELEVANT TO FORWARD-LOOKING INFORMATION FOR THE PURPOSE OF "SAFE HARBOR" PROVISIONS OF THE PRIVATE SECURITIES LITIGATION REFORM ACT OF 1995

This press release contains forward-looking statements relating to Chevron's operations that are based on management's current expectations, estimates and projections about the petroleum, chemicals and other energy-related industries. Words such as "anticipates," "expects," "intends," "plans," "targets," "forecasts," "projects," "believes," "seeks," "schedules," "estimates," "budgets," "outlook" and similar expressions are intended to identify such forward-looking statements. These statements are not guarantees of future performance and are subject to certain risks, uncertainties and other factors, many of which are beyond the company's control and are difficult to predict. Therefore, actual outcomes and results may differ materially from what is expressed or forecasted in such forward-looking statements. The reader should not place undue reliance on these forward-looking statements, which speak only as of the date of this press release. Unless legally required, Chevron undertakes no obligation to update publicly any forward-looking statements, whether as a result of new information, future events or otherwise.

Among the important factors that could cause actual results to differ materially from those in the forward-looking statements are: changing crude oil and natural gas prices; changing refining, marketing and chemicals margins; actions of competitors or regulators; timing of exploration expenses; timing of crude oil liftings; the competitiveness of alternate-energy sources or product substitutes; technological developments; the results of operations and financial condition of equity affiliates; the inability or failure of the company's joint-venture partners to fund their share of operations and development activities; the potential failure to achieve expected net production from existing and future crude oil and natural gas development projects; potential delays in the development, construction or start-up of planned projects; the potential disruption or interruption of the company's production or manufacturing facilities or delivery/transportation networks due to war, accidents, political events, civil unrest, severe weather or crude oil production quotas that might be imposed by the Organization of Petroleum Exporting Countries; the potential liability for remedial actions or assessments under existing or future environmental regulations and litigation; significant investment or product changes required by existing or future environmental statutes, regulations and litigation; the potential liability resulting from other pending or future litigation; the company's future acquisition or disposition of assets and gains and losses from asset dispositions or impairments; government-mandated sales, divestitures, recapitalizations, industry-specific taxes, changes in fiscal terms or restrictions on scope of company

operations; foreign currency movements compared with the U.S. dollar; the effects of changed accounting rules under generally accepted accounting principles promulgated by rule-setting bodies; and the factors set forth under the heading "Risk Factors" on pages 28 through 30 of the company's 2012 Annual Report on Form 10-K. In addition, such results could be affected by general domestic and international economic and political conditions. Other unpredictable or unknown factors not discussed in this press release could also have material adverse effects on forward-looking statements.

CHEVRON CORPORATION - FINANCIAL REVIEW **Attachment 1**
(Millions of Dollars, Except Per-Share Amounts)

CONSOLIDATED STATEMENT OF INCOME
(unaudited)

	Three Months Ended September 30		Nine Months Ended September 30	
REVENUES AND OTHER INCOME	**2013**	**2012**	**2013**	**2012**
Sales and other operating revenues *	**$ 56,603**	$ 55,660	**$ 166,206**	$ 174,336
Income from equity affiliates	**1,635**	1,274	**5,703**	5,074
Other income	**265**	1,110	**781**	1,947
Total Revenues and Other Income	**58,503**	58,044	**172,690**	181,357
COSTS AND OTHER DEDUCTIONS				
Purchased crude oil and products	**34,822**	33,982	**102,005**	106,807
Operating, selling, general and administrative expenses	**7,263**	7,046	**21,440**	19,839
Exploration expenses	**559**	475	**1,135**	1,371
Depreciation, depletion and amortization	**3,658**	3,370	**10,551**	9,859
Taxes other than on income *	**3,366**	3,239	**9,852**	9,125
Interest and debt expense	**-**	-	**-**	-
Total Costs and Other Deductions	**49,668**	48,112	**144,983**	147,001
Income Before Income Tax Expense	**8,835**	9,932	**27,707**	34,356
Income tax expense	**3,839**	4,624	**11,068**	15,317
Net Income	**4,996**	5,308	**16,639**	19,039
Less: Net income attributable to noncontrolling interests	**46**	55	**146**	105
NET INCOME ATTRIBUTABLE TO CHEVRON CORPORATION	**$ 4,950**	$ 5,253	**$ 16,493**	$ 18,934
PER-SHARE OF COMMON STOCK				
Net Income Attributable to Chevron Corporation				
- Basic	**$ 2.58**	$ 2.71	**$ 8.58**	$ 9.69
- Diluted	**$ 2.57**	$ 2.69	**$ 8.52**	$ 9.62
Dividends	**$ 1.00**	$ 0.90	**$ 2.90**	$ 2.61
Weighted Average Number of Shares Outstanding (000's)				
- Basic	**1,914,047**	1,945,840	**1,921,429**	1,954,584
- Diluted	**1,929,831**	1,960,141	**1,936,797**	1,968,939
* Includes excise, value-added and similar taxes.	**$ 2,223**	$ 2,163	**$ 6,364**	$ 5,879

CHEVRON CORPORATION - FINANCIAL REVIEW **Attachment 2**
(Millions of Dollars)
(unaudited)

EARNINGS BY MAJOR OPERATING AREA	Three Months Ended September 30		Nine Months Ended September 30	
	2013	**2012**	**2013**	**2012**
Upstream				
United States	**$ 1,026**	$ 1,122	**$ 3,241**	$ 3,969
International	**4,066**	4,017	**12,716**	12,961
Total Upstream	**5,092**	5,139	**15,957**	16,930
Downstream				
United States	**249**	456	**522**	1,717
International	**131**	233	**1,325**	1,657
Total Downstream	**380**	689	**1,847**	3,374
All Other [1]	**(522)**	(575)	**(1,311)**	(1,370)
Total [2]	**$ 4,950**	$ 5,253	**$ 16,493**	$ 18,934

SELECTED BALANCE SHEET ACCOUNT DATA	Sept. 30, 2013	Dec. 31, 2012
Cash and Cash Equivalents	**$ 17,014**	$ 20,939
Time Deposits	**$ 1,308**	$ 708
Marketable Securities	**$ 258**	$ 266
Total Assets	**$ 247,838**	$ 232,982
Total Debt	**$ 18,581**	$ 12,192
Total Chevron Corporation Stockholders' Equity	**$ 144,779**	$ 136,524

CAPITAL AND EXPLORATORY EXPENDITURES [3]	Three Months Ended September 30		Nine Months Ended September 30	
	2013	**2012**	**2013**	2012
United States				
Upstream	**$ 2,067**	$ 1,696	**$ 5,913**	$ 5,043
Downstream	**517**	442	**1,287**	1,121
Other	**159**	188	**446**	340
Total United States	**2,743**	2,326	**7,646**	6,504
International				
Upstream	**7,605**	5,841	**20,566**	15,419
Downstream	**230**	262	**690**	747
Other	**7**	1	**17**	3
Total International	**7,842**	6,104	**21,273**	16,169
Worldwide	**$ 10,585**	$ 8,430	**$ 28,919**	$ 22,673

(1) Includes mining operations, power generation businesses, worldwide cash management and debt financing activities, corporate administrative functions, insurance operations, real estate activities, energy services, alternative fuels and technology companies.

(2) Net Income Attributable to Chevron Corporation (See Attachment 1)

(3) Includes interest in affiliates:

United States	**$ 219**	$ 84	**$ 450**	$ 182
International	**465**	457	**1,304**	1,186
Total	**$ 684**	$ 541	**$ 1,754**	$ 1,368

CHEVRON CORPORATION - FINANCIAL REVIEW

Attachment 3

OPERATING STATISTICS [1]	Three Months Ended September 30		Nine Months Ended September 30	
NET LIQUIDS PRODUCTION (MB/D): [2]	**2013**	**2012**	**2013**	**2012**
United States	**448**	440	**452**	452
International	**1,279**	1,249	**1,281**	1,302
Worldwide	**1,727**	1,689	**1,733**	1,754
NET NATURAL GAS PRODUCTION (MMCF/D): [3]				
United States	**1,242**	1,184	**1,241**	1,180
International	**3,910**	3,778	**3,983**	3,840
Worldwide	**5,152**	4,962	**5,224**	5,020
TOTAL NET OIL-EQUIVALENT PRODUCTION (MB/D): [4]				
United States	**655**	637	**659**	649
International	**1,930**	1,879	**1,945**	1,941
Worldwide	**2,585**	2,516	**2,604**	2,590
SALES OF NATURAL GAS (MMCF/D):				
United States	**5,643**	5,447	**5,795**	5,457
International	**4,072**	4,008	**4,279**	4,349
Worldwide	**9,715**	9,455	**10,074**	9,806
SALES OF NATURAL GAS LIQUIDS (MB/D):				
United States	**133**	152	**137**	154
International	**90**	92	**89**	87
Worldwide	**223**	244	**226**	241
SALES OF REFINED PRODUCTS (MB/D):				
United States	**1,195**	1,183	**1,169**	1,231
International [5]	**1,561**	1,561	**1,520**	1,550
Worldwide	**2,756**	2,744	**2,689**	2,781
REFINERY INPUT (MB/D):				
United States	**831**	779	**742**	877
International [6]	**885**	909	**858**	853
Worldwide	**1,716**	1,688	**1,600**	1,730
(1) Includes interest in affiliates.				
(2) Includes: Canada - Synthetic Oil	**43**	45	**42**	42
Venezuela Affiliate - Synthetic Oil	**30**	1	**23**	14
(3) Includes natural gas consumed in operations (MMCF/D):				
United States [7]	**70**	54	**74**	64
International	**518**	504	**519**	523
(4) Oil-equivalent production is the sum of net liquids production and net gas production. The oil-equivalent gas conversion ratio is 6,000 cubic feet of natural gas = 1 barrel of crude oil.				
(5) Includes share of affiliate sales (MB/D):	**474**	491	**472**	522
(6) As of June 2012, Star Petroleum Refining Company crude-input volumes are reported on a 100 percent consolidated basis. Prior to June 2012, crude-input volumes reflect a 64 percent equity interest.				
(7) 2012 conforms to 2013 presentation.				

ConocoPhillips

Third-Quarter 2013 Detailed Supplemental Information

$ Millions, Except as Indicated	2012					2013				
	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	YTD	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	YTD
CONSOLIDATED INCOME STATEMENT										
Revenues and Other Income										
Sales and other operating revenues	14,593	13,664	14,141	15,569	57,967	14,166	13,350	13,643		41,159
Equity in earnings of affiliates	490	529	412	480	1,911	362	494	709		1,565
Gain on dispositions	940	583	118	16	1,657	58	85	1,099		1,222
Other income	60	66	42	301	469	65	203	49		317
Total Revenues and Other Income	16,083	14,842	14,713	16,366	62,004	14,651	14,142	15,470		44,263
Costs and Expenses										
Purchased commodities	6,078	5,721	6,357	7,076	25,232	5,834	5,521	5,708		17,063
Production and operating expenses	1,559	1,802	1,637	1,795	6,793	1,687	1,672	1,962		5,321
Selling, general and administrative expenses	326	235	329	216	1,106	165	193	249		607
Exploration expenses	675	265	215	345	1,500	277	321	313		911
Depreciation, depletion and amortization	1,571	1,580	1,650	1,779	6,580	1,807	1,832	1,902		5,541
Impairments	214	82	-	384	680	2	28	1		31
Taxes other than income taxes	1,095	900	673	878	3,546	892	842	664		2,198
Accretion on discounted liabilities	105	103	100	86	394	106	105	106		317
Interest and debt expense	190	197	161	161	709	130	139	151		420
Foreign currency transaction (gains) losses	5	12	-	24	41	(36)	(7)	9		(34)
Total Costs and Expenses	11,818	10,897	11,122	12,744	46,581	10,864	10,446	11,065		32,375
Income from continuing operations before income taxes	4,265	3,945	3,591	3,622	15,423	3,787	3,696	4,405		11,888
Provision for income taxes	2,086	2,225	1,851	1,780	7,942	1,763	1,630	1,966		5,359
Income from continuing operations	2,179	1,720	1,740	1,842	7,481	2,024	2,066	2,439		6,529
Income from discontinued operations	776	569	73	(401)	1,017	129	(3)	57		183
Net Income	2,955	2,289	1,813	1,441	8,498	2,153	2,063	2,496		6,712
Less: net income attributable to noncontrolling interests	(18)	(22)	(15)	(15)	(70)	(14)	(13)	(16)		(43)
Net Income Attributable to ConocoPhillips	2,937	2,267	1,798	1,426	8,428	2,139	2,050	2,480		6,669
Net Income Attributable to ConocoPhillips Per Share of Common Stock (dollars)										
Basic										
Continuing operations	1.89	1.36	1.41	1.49	5.95	1.64	1.66	1.96		5.26
Discontinued operations	0.60	0.46	0.06	(0.33)	0.82	0.10	-	0.05		0.15
Net Income Attributable to ConocoPhillips Per Share of Common Stock	2.29	1.82	1.47	1.16	6.77	1.74	1.66	2.01		5.41
Diluted										
Continuing operations	1.67	1.35	1.40	1.48	5.91	1.63	1.65	1.95		5.23
Discontinued operations	0.60	0.45	0.06	(0.32)	0.81	0.10	-	0.05		0.15
Net Income Attributable to ConocoPhillips Per Share of Common Stock	2.27	1.80	1.46	1.16	6.72	1.73	1.65	2.00		5.38
Average Common Shares Outstanding (in thousands)										
Basic	1,283,493	1,248,300	1,220,462	1,223,422	1,243,799	1,229,232	1,229,773	1,231,054		1,230,027
Diluted	1,293,104	1,258,189	1,229,343	1,231,395	1,253,093	1,235,907	1,237,157	1,240,365		1,238,943
INCOME (LOSS) FROM CONTINUING OPERATIONS BEFORE INCOME TAXES										
Alaska	983	856	820	882	3,541	842	1,060	787		2,689
Lower 48 and Latin America	426	207	250	279	1,162	260	352	765		1,377
Canada	(725)	(134)	(39)	(38)	(936)	(117)	10	888		781
Europe	1,464	1,896	962	1,188	5,510	1,191	625	960		2,776
Asia Pacific and Middle East	2,204	1,090	1,105	1,175	5,574	1,393	1,416	1,120		3,929
Other International	282	409	798	356	1,845	401	381	196		978
Corporate and Other	(369)	(379)	(305)	(220)	(1,273)	(183)	(148)	(291)		(622)
Consolidated	4,265	3,945	3,591	3,622	15,423	3,787	3,696	4,405		11,888
EFFECTIVE INCOME TAX RATES FOR CONTINUING OPERATIONS										
Alaska*	38.9%	35.7%	34.8%	35.4%	35.8%	35.5%	35.7%	37.1%		36.1%
Lower 48 and Latin America	40.2%	42.6%	28.9%	-69.0%	11.4%	49.1%	29.6%	34.9%		36.2%
Canada	24.3%	29.8%	19.2%	73.2%	26.9%	213.7%	52.2%	26.0%		-2.5%
Europe	73.4%	64.7%	66.3%	74.0%	72.8%	63.8%	58.3%	70.4%		64.8%
Asia Pacific and Middle East	20.4%	27.1%	38.1%	35.0%	28.3%	33.1%	27.2%	32.4%		30.8%
Other International	92.8%	114.0%	38.3%	127.2%	80.5%	96.5%	96.2%	101.2%		97.3%
Corporate and Other	15.8%	31.1%	16.7%	23.9%	22.0%	11.7%	-16.8%	19.4%		8.5%
Consolidated	48.9%	56.4%	51.5%	49.1%	51.5%	46.6%	44.1%	44.6%		45.1%
*Alaska including taxes other than income taxes	66.0%	63.9%	56.7%	61.7%	62.5%	61.6%	52.9%	57.9%		57.4%

ConocoPhillips

$ Millions	2012 1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	YTD	2013 1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	YTD
EARNINGS BY SEGMENT										
Alaska	620	551	535	570	2,276	543	682	494		1,719
Lower 48 and Latin America*	255	119	182	473	1,029	133	247	498		878
Canada	(549)	(94)	(31)	(10)	(684)	133	5	642		780
Europe	389	669	132	308	1,498	431	261	284		975
Asia Pacific and Middle East	1,738	772	669	749	3,928	916	1,017	741		2,676
Other International	21	(57)	492	(97)	359	14	14	(2)		26
Corporate and Other	(311)	(262)	(254)	(166)	(993)	(162)	(173)	(234)		(569)
Discontinued Operations - Phillips 66	712	534	2	(16)	1,232	-	-	-		-
Discontinued Operations - Other	62	35	71	(385)	(217)	129	(3)	57		183
Consolidated	2,937	2,267	1,798	1,426	8,426	2,139	2,050	2,480		6,669
Lower 48 only	234	104	145	262	745	105	239	210		548
SPECIAL ITEMS (AFTER-TAX)										
Alaska	-	-	-	(25)	(25)	-	97	-		97
Lower 48 and Latin America*	-	-	-	316	316	(60)	69	288		297
Canada	(520)	-	-	(42)	(562)	224	-	461		685
Europe	-	255	(167)	(80)	8	83	-	-		83
Asia Pacific and Middle East	937	(17)	(133)	-	787	-	145	(116)		30
Other International	-	-	443	(108)	335	-	-	-		-
Corporate and Other	(33)	(40)	(118)	11	(180)	11	(9)	(31)		(29)
Discontinued Operations - Phillips 66	712	534	2	(16)	1,232	-	-	-		-
Discontinued Operations - Other	62	35	71	(385)	(217)	129	(3)	57		183
Consolidated	1,158	767	98	(329)	1,694	387	300	659		1,346
Lower 48 only	-	-	-	115	115	(60)	69	-		9
ADJUSTED EARNINGS										
Alaska	620	551	535	595	2,301	543	585	494		1,622
Lower 48 and Latin America*	255	119	182	157	713	193	178	210		581
Canada	(29)	(94)	(31)	32	(122)	(91)	5	181		95
Europe	389	414	299	388	1,490	348	261	284		893
Asia Pacific and Middle East	801	789	802	749	3,141	916	871	857		2,644
Other International	21	(57)	49	11	24	14	14	(2)		26
Corporate and Other	(278)	(222)	(136)	(177)	(813)	(173)	(164)	(203)		(540)
Consolidated	1,779	1,500	1,700	1,755	6,734	1,752	1,750	1,821		5,323
Lower 48 only	234	104	145	147	630	165	164	210		539
ADJUSTED EFFECTIVE INCOME TAX RATES FOR CONTINUING OPERATIONS										
Alaska	36.9%	35.7%	34.8%	35.5%	35.8%	35.5%	35.6%	37.1%		36.0%
Lower 48 and Latin America	40.2%	42.6%	26.9%	42.1%	38.2%	40.2%	35.5%	39.6%		38.6%
Canada	7.2%	29.8%	19.2%	-81.8%	34.3%	22.2%	52.2%	28.7%		35.5%
Europe	73.4%	70.2%	69.0%	71.2%	71.1%	68.4%	58.3%	70.4%		66.8%
Asia Pacific and Middle East	36.8%	30.6%	35.2%	36.2%	34.8%	34.1%	31.2%	31.5%		31.6%
Other International	92.6%	114.0%	91.7%	97.4%	98.6%	96.5%	96.2%	101.2%		97.3%
Corporate and Other	17.8%	33.4%	4.8%	24.0%	22.4%	11.0%	-19.6%	15.5%		5.6%
Consolidated	56.1%	57.5%	53.6%	55.5%	55.7%	53.3%	47.4%	48.7%		49.7%

ConocoPhillips

$ Millions	2012					2013				
DETAILED SPECIAL ITEMS (AFTER-TAX)	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	YTD	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	YTD
Alaska										
Pending claims and settlements	-	-	-	(25)	(25)	-	97	-		97
Total	-	-	-	(25)	(25)	-	97	-		97
Lower 48 and Latin America										
Gain (loss) on asset sales	-	-	-	-	-	(39)	47	288		296
Impairments	-	-	-	(121)	(121)	-	-	-		-
Tax loss carryforward realization	-	-	-	236	236	(21)	22	-		1
Pending claims and settlements	-	-	-	201	201	-	-	-		-
Total	-	-	-	316	316	(60)	69	288		297
Canada										
Gain (loss) on asset sales	-	-	-	-	-	224	-	461		685
Impairments	(520)	-	-	(42)	(562)	-	-	-		-
Total	(520)	-	-	(42)	(562)	224	-	461		685
Europe										
International tax law changes	-	-	(167)	-	(167)	-	-	-		-
Gain (loss) on asset sales	-	285	-	-	285	83	-	-		83
Impairments	-	(30)	-	(80)	(110)	-	-	-		-
Total	-	255	(167)	(80)	8	83	-	-		83
Asia Pacific and Middle East										
Gain (loss) on asset sales	937	-	(133)	-	804	-	-	-		-
Bohai Bay incidents	-	(89)	-	-	(89)	-	-	-		-
Deferred tax adjustment	-	72	-	-	72	-	-	-		-
Pending claims and settlements	-	-	-	-	-	-	146	(116)		30
Total	937	(17)	(133)	-	787	-	146	(116)		30
Other International										
Gain (loss) on asset sales	-	-	443	-	443	-	-	-		-
Impairments	-	-	-	(108)	(108)	-	-	-		-
Total	-	-	443	(108)	335	-	-	-		-
Corporate and Other										
Gain (loss) on asset sales	-	-	-	-	-	11	-	-		11
Separation costs	(33)	(40)	(7)	(4)	(84)	-	-	-		-
Pension settlement expense	-	-	(62)	(5)	(67)	-	-	(31)		(31)
Premium on early debt retirement	-	-	(68)	-	(68)	-	-	-		-
Pending claims and settlements	-	-	39	20	59	-	(9)	-		(9)
Total	(33)	(40)	(118)	11	(180)	11	(9)	(31)		(29)
Discontinued Operations - Phillips 66	712	534	2	(15)	1,232	-	-	-		-
Discontinued Operations - Other	62	35	71	(385)	(217)	129	(3)	57		183
Total Company	1,158	767	98	(329)	1,684	387	300	659		1,346
**Lower 48 only.*	-	-	-	115	115	(60)	69	-		9

ConocoPhillips

$ Millions	2012					2013				
CASH FLOW INFORMATION	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	YTD	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	YTD
Cash Flows from Operating Activities										
Net income	2,955	2,289	1,813	1,441	8,498	2,153	2,063	2,496		6,712
Depreciation, depletion and amortization	1,571	1,580	1,650	1,779	6,580	1,607	1,832	1,902		5,341
Impairments	214	82	-	384	680	2	28	1		31
Dry hole costs and leasehold impairments	518	116	69	171	874	36	176	133		345
Accretion on discounted liabilities	105	103	100	86	394	106	105	106		317
Deferred taxes	131	284	396	586	1,397	241	443	458		1,142
Undistributed equity earnings	(77)	(179)	(153)	(187)	(596)	(29)	(199)	(357)		(585)
Gain on dispositions	(940)	(583)	(118)	(16)	(1,657)	(58)	(95)	(1,069)		(1,222)
Income from discontinued operations	(776)	(569)	(73)	401	(1,017)	(129)	3	(57)		(183)
Other	173	(279)	53	(403)	(456)	(503)	17	206		(280)
Net working capital changes	196	(766)	(297)	(372)	(1,239)	962	(684)	(175)		123
Net cash provided by continuing operations	4,070	2,078	3,440	3,870	13,458	4,606	3,689	3,644		11,941
Net cash provided by discontinued operations	112	272	80		464	122	52	61		235
Net Cash Provided by Operating Activities	4,182	2,350	3,520	3,870	13,922	4,730	3,741	3,705		12,176
Cash Flows from Investing Activities										
Capital expenditures and investments	(3,818)	(3,623)	(3,279)	(3,452)	(14,172)	(3,391)	(3,705)	(4,185)		(11,281)
Proceeds from asset dispositions	1,102	464	522	44	2,132	1,134	542	1,499		3,175
Net sales (purchases) of short-term investments	92	505	-	-	597	(23)	(51)	75		1
Long-term collections from related parties and other investments	45	23	207	660	935	36	(11)	54		79
Net cash used in continuing operations	(2,579)	(2,631)	(2,550)	(2,748)	(10,508)	(2,244)	(3,225)	(2,557)		(8,026)
Net cash used in discontinued operations	(431)	(284)	(223)	(181)	(1,119)	(189)	(190)	(161)		(540)
Net Cash Used in Investing Activities	(3,010)	(2,915)	(2,773)	(2,929)	(11,627)	(2,433)	(3,415)	(2,718)		(8,566)
Cash Flows from Financing Activities										
Net issuance (repayment) of debt	(47)	831	(1,967)	614	(569)	(48)	(850)	(48)		(946)
Special cash distribution from Phillips 66	-	7,818	-	-	7,818	-	-	-		-
Change in restricted cash	-	(5,000)	2,532	1,720	(748)	748	-	-		748
Issuance of company common stock	36	9	28	55	128	(10)	5	17		12
Repurchase of company common stock	(1,899)	(3,050)	(149)	-	(5,098)	-	-	-		-
Dividends paid	(843)	(818)	(808)	(809)	(3,278)	(815)	(814)	(852)		(2,481)
Other	(199)	(170)	(178)	(178)	(725)	(205)	(186)	(202)		(593)
Net cash provided by (used in) continuing operations	(2,952)	(380)	(532)	1,402	(2,462)	(330)	(1,845)	(1,085)		(3,260)
Net cash used in discontinued operations	(318)	(1,701)	-	-	(2,019)	-	-	-		-
Net Cash Provided by (Used in) Financing Activities	(3,270)	(2,081)	(532)	1,402	(4,481)	(330)	(1,845)	(1,085)		(3,260)
Effect of Exchange Rate Changes	25	(17)	9	7	24	(163)	6	72		(85)
Net Change in Cash and Cash Equivalents	(2,073)	(2,663)	224	2,350	(2,162)	1,804	(1,513)	(26)		265
Cash and cash equivalents at beginning of period	5,780	3,707	1,044	1,268	5,780	3,618	5,422	3,909		3,618
Cash and Cash Equivalents at End of Period	3,707	1,044	1,268	3,618	3,618	5,422	3,909	3,883		3,883
CAPITAL PROGRAM										
Capital expenditures and investments										
Alaska	186	202	206	232	828	282	283	291		838
Lower 48 and Latin America	1,267	1,288	1,339	1,357	5,251	1,280	1,377	1,244		3,901
Canada	629	428	493	634	2,184	675	422	505		1,602
Europe	622	735	738	765	2,860	791	765	791		2,347
Asia Pacific and Middle East	599	886	466	377	2,430	337	827	1,142		2,306
Other International	354	34	11	16	415	19	4	169		192
Corporate and Other	61	50	22	71	204	27	27	43		97
Total capital expenditures and investments	3,818	3,623	3,279	3,452	14,172	3,391	3,705	4,185		11,281
Joint venture acquisition obligation (principal) - Canada	180	181	185	187	733	189	192	194		575
Total Capital Program	3,998	3,804	3,464	3,639	14,905	3,580	3,897	4,379		11,856
Capital Program for Algeria, Nigeria and Kashagan	*220*	*190*	*225*	*182*	*817*	*189*	*190*	*161*		*540*

ConocoPhillips

TOTAL SEGMENTS	2012 1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	YTD	2013 1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	YTD
Production										
Total (MBOED)										
Continuing operations, including equity affiliates	1,581	1,489	1,470	1,566	1,527	1,555	1,510	1,470		1,511
Discontinued operations (Algeria and Nigeria)	56	53	55	41	51	41	42	44		42
Total, including equity affiliates	1,637	1,542	1,525	1,607	1,578	1,596	1,552	1,514		1,553
Crude Oil (MBD)										
Consolidated operations	590	554	528	598	567	606	565	532		567
Equity affiliates	34	31	25	21	28	20	20	20		20
Total continuing operations	624	585	553	619	595	626	585	552		587
Discontinued operations (Algeria and Nigeria)	26	23	25	17	23	20	18	19		19
Total	650	608	578	636	618	646	603	571		606
Over (under) lifting of crude oil (MBD)*	(11)	29	32	25	19	(9)	4	19		5
**Includes continuing and discontinued operations.*										
NGL (MBD)										
Consolidated operations	155	143	144	152	148	151	150	148		150
Equity affiliates	8	7	7	8	8	8	8	8		8
Total continuing operations	163	150	151	160	156	159	158	156		158
Discontinued operations (Nigeria)	3	4	4	3	4	3	3	4		3
Total	166	154	155	163	160	162	161	160		161
Bitumen (MBD)										
Consolidated operations	11	11	12	12	12	13	12	13		12
Equity affiliates	73	77	80	94	81	96	88	94		93
Total	84	88	92	106	93	109	100	107		105
Natural Gas (MMCFD)										
Consolidated operations	3,756	3,509	3,588	3,592	3,611	3,479	3,505	3,423		3,469
Equity affiliates	505	491	449	497	485	483	493	507		494
Total continuing operations	4,261	4,000	4,037	4,089	4,096	3,962	3,998	3,930		3,963
Discontinued operations (Nigeria)	161	153	162	120	149	110	128	125		121
Total	4,422	4,153	4,199	4,209	4,245	4,072	4,126	4,055		4,084
Industry Prices (Platt's)										
Crude Oil ($/BBL)										
WTI	102.99	93.44	92.11	88.09	94.16	94.29	94.12	105.80		98.07
WCS*	78.50	79.73	66.47	71.22	74.48	81.51	74.97	83.25		73.24
Brent dated	118.49	108.19	109.61	110.02	111.58	112.55	102.44	110.32		108.44
JCC	111.43	116.70	121.99	105.85	113.99	114.19	113.07	107.38		111.54
Natural Gas ($/MMBTU)										
Henry Hub first of month	2.72	2.21	2.80	3.41	2.79	3.34	4.10	3.58		3.67
**Quoted WCS price reflects a one-month lag.*										
Average Realized Prices										
Crude Oil ($/BBL)										
Consolidated operations	111.91	105.77	102.79	103.16	105.86	106.17	100.31	106.85		104.43
Equity affiliates	111.37	99.28	96.57	100.90	102.80	100.27	53.41	99.41		97.67
Total continuing operations	111.88	105.43	102.54	103.08	105.72	105.97	100.07	106.60		104.20
Discontinued operations (Algeria and Nigeria)	122.73	108.92	106.97	112.15	112.90	112.62	103.45	110.28		109.59
Total	112.33	105.56	102.72	103.33	105.98	106.20	100.14	106.74		104.37
NGL ($/BBL)										
Consolidated operations	53.26	42.77	40.02	42.38	44.62	40.87	36.21	39.44		38.85
Equity affiliates	88.24	70.28	62.18	86.97	77.30	77.32	64.63	69.90		70.68
Total continuing operations	55.03	44.36	41.08	44.93	46.36	42.95	37.80	41.14		40.64
Discontinued operations (Nigeria)	11.97	15.34	14.26	11.06	13.30	12.30	13.13	15.76		13.97
Total	54.11	43.55	40.39	44.15	45.55	42.41	37.24	40.47		40.05
Bitumen ($/BBL)										
Consolidated operations	64.95	54.75	56.23	55.29	57.58	36.78	59.67	76.90		59.18
Equity affiliates	60.04	50.85	50.95	47.43	53.39	39.52	55.13	75.93		56.79
Total	60.66	51.38	50.86	48.32	53.91	39.23	55.69	76.06		57.08
Natural Gas ($/MCF)										
Consolidated operations	5.20	4.72	4.86	5.50	5.07	5.75	5.88	5.49		5.71
Equity affiliates	8.62	8.98	8.66	7.90	8.54	9.36	8.84	9.35		9.18
Total continuing operations	5.61	5.25	5.28	5.79	5.48	6.19	6.25	5.99		6.14
Discontinued operations (Nigeria)	2.53	2.51	2.84	2.32	2.57	2.54	2.98	2.58		2.71
Total	5.49	5.14	5.18	5.69	5.38	6.09	6.15	5.88		6.04
First and second quarter of 2013 consolidated operations have been restated to reflect certain adjustments.										
Exploration Expenses ($ Millions)										
Dry holes	6	64	6	79	155	4	98	101		203
Leasehold impairment	512	52	63	92	719	32	78	32		142
Total noncash expenses	518	116	69	171	874	36	176	133		345
Other (G&A, G&G and lease rentals)	157	149	146	174	626	241	145	180		566
Total exploration expenses	675	265	215	345	1,500	277	321	313		911
U.S. exploration expenses	87	96	106	126	415	152	196	165		513
International exploration expenses	588	169	109	219	1,085	125	125	148		398
DD&A ($ Millions)										
Alaska	134	134	117	131	516	135	135	124		394
Lower 48 and Latin America	603	625	657	719	2,604	744	785	880		2,409
Canada	324	333	355	326	1,338	343	345	330		1,018
Europe	266	246	214	267	993	261	234	234		729
Asia Pacific and Middle East	211	210	274	303	998	293	296	303		894
Other International	9	11	12	13	45	11	12	5		28
Corporate and Other	24	21	21	20	86	20	23	26		69
Total DD&A	1,571	1,580	1,650	1,779	6,580	1,807	1,832	1,902		5,541

ConocoPhillips

PRODUCTION	2012 1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	YTD	2013 1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	YTD
Crude Oil (MBD)										
Consolidated operations										
Alaska	208	190	157	196	188	190	176	161		176
Lower 48	117	115	124	136	123	148	147	153		149
Canada	13	14	14	13	13	14	14	13		14
Norway	112	103	97	103	104	100	78	84		91
United Kingdom	44	35	20	27	31	24	22	17		21
Europe	156	138	117	130	135	124	100	101		112
Australia/Timor-Leste	17	15	18	16	16	13	15	13		13
China	23	31	48	54	39	57	56	51		55
Indonesia	10	8	9	9	9	9	7	8		8
Malaysia	-	-	-	4	1	7	6	5		6
Vietnam	11	-	-	-	3	-	-	-		-
AP/ME	61	54	75	83	68	86	84	77		82
Libya	35	43	41	40	40	44	44	17		34
Other International	35	43	41	40	40	44	44	17		34
Total consolidated operations	590	554	526	598	567	606	565	532		567
Equity affiliates	34	31	25	21	28	20	20	20		20
Total continuing operations	624	585	553	619	595	626	585	552		587
Discontinued operations (Algeria and Nigeria)	26	23	25	17	23	20	18	19		19
Total	650	608	578	636	618	646	603	571		606
NGL (MBD)										
Consolidated operations										
Alaska	18	16	10	17	16	18	15	11		15
Lower 48	84	83	87	87	85	87	91	94		91
Canada	25	22	25	24	24	26	25	25		25
Norway	5	4	3	3	4	3	2	3		2
United Kingdom	5	4	2	4	3	3	3	2		3
Europe	10	8	5	7	7	6	5	5		5
Australia/Timor-Leste	12	9	12	12	11	10	10	9		10
Indonesia	6	5	5	5	5	4	4	4		4
AP/ME	18	14	17	17	16	14	14	13		14
Total consolidated operations	155	143	144	152	148	151	150	148		150
Equity affiliates	8	7	7	8	8	8	8	8		8
Total continuing operations	163	150	151	160	156	159	158	156		158
Discontinued operations (Nigeria)	3	4	4	3	4	3	3	4		3
Total	166	154	155	163	160	162	161	160		161
Bitumen (MBD)										
Consolidated operations	11	11	12	12	12	13	12	13		12
Equity affiliates	73	77	80	94	81	96	88	94		93
Total	84	88	92	106	93	109	100	107		105
Natural Gas (MMCFD)										
Consolidated operations										
Alaska	59	56	51	56	55	56	38	35		43
Lower 48	1,502	1,456	1,507	1,508	1,493	1,441	1,516	1,511		1,490
Canada	863	864	874	826	857	806	788	775		790
Norway	195	141	127	176	160	161	119	130		137
United Kingdom	437	399	287	302	356	300	290	227		272
Europe	632	540	414	478	516	461	409	357		409
Australia/Timor-Leste	249	159	261	251	230	251	272	268		264
China	-	1	4	5	3	4	6	4		4
Indonesia	441	427	444	438	437	428	447	439		438
Malaysia	-	-	-	-	-	1	1	1		1
Vietnam	7	-	-	-	2	-	-	-		-
AP/ME	697	587	709	694	672	684	726	712		707
Libya	3	6	33	30	18	31	28	33		30
Other International	3	6	33	30	18	31	28	33		30
Total consolidated operations	3,796	3,508	3,586	3,592	3,611	3,479	3,505	3,423		3,469
Equity affiliates	505	491	449	497	485	483	493	507		494
Total continuing operations	4,261	4,000	4,037	4,089	4,096	3,962	3,998	3,930		3,963
Discontinued operations (Nigeria)	161	153	162	120	149	110	128	125		121
Total	4,422	4,153	4,199	4,209	4,245	4,072	4,126	4,055		4,084
Total (MBOED)										
Consolidated operations										
Alaska	236	215	176	222	213	218	197	178		198
Lower 48	451	441	462	475	457	475	491	499		488
Canada	193	191	197	187	192	187	183	180		183
Norway	149	131	121	135	135	130	100	119		116
United Kingdom	122	105	70	81	93	77	73	57		69
Europe	271	236	191	216	228	207	173	176		185
Australia/Timor-Leste	70	51	73	69	66	65	70	67		67
China	23	31	49	55	40	58	57	52		56
Indonesia	90	84	88	87	87	84	86	85		85
Malaysia	-	-	-	4	1	7	6	5		6
Vietnam	12	-	-	-	3	-	-	-		-
AP/ME	195	166	210	215	197	214	219	209		214
Libya	36	43	47	45	43	49	49	22		39
Other International	36	43	47	45	43	49	49	22		39
Total consolidated operations	1,382	1,292	1,283	1,360	1,330	1,350	1,312	1,264		1,307
Equity affiliates	199	197	187	206	197	205	198	206		204
Total continuing operations	1,581	1,489	1,470	1,566	1,527	1,555	1,510	1,470		1,511
Discontinued operations (Algeria and Nigeria)	56	53	55	41	51	41	42	44		42
Total	1,637	1,542	1,525	1,607	1,578	1,596	1,552	1,514		1,553

ConocoPhillips

AVERAGE REALIZED PRICES	2012 1st Qtr	2012 2nd Qtr	2012 3rd Qtr	2012 4th Qtr	2012 YTD	2013 1st Qtr	2013 2nd Qtr	2013 3rd Qtr	2013 4th Qtr	2013 YTD
Crude Oil ($/BBL)										
Consolidated operations										
Alaska	112.20	112.38	106.53	106.91	109.62	110.79	105.09	110.95		109.14
Lower 48	99.00	89.61	90.06	88.63	91.67	93.69	93.56	100.25		95.92
Canada	83.85	74.76	77.19	77.71	78.26	72.85	81.09	91.81		81.71
Norway	122.49	109.50	111.74	111.87	113.80	114.75	103.21	112.50		111.22
United Kingdom	116.54	111.55	104.55	109.54	110.31	111.07	101.67	110.62		106.88
Europe	121.25	109.89	109.67	111.51	113.08	114.11	102.74	112.28		110.40
Australia/Timor-Leste	113.00	103.53	105.47	103.31	106.66	107.76	97.11	103.84		103.38
China	122.02	113.71	107.68	105.01	109.94	110.91	98.58	106.36		105.31
Indonesia	109.16	96.96	91.45	93.95	98.21	93.32	83.15	93.35		90.12
Malaysia	-	-	-	-	-	119.87	108.67	114.90		114.50
Vietnam	126.02	-	-	-	126.02	-	-	-		-
AP/ME	117.66	109.12	105.12	103.34	108.20	109.35	97.77	105.43		104.30
Libya	121.68	109.52	108.00	109.95	110.75	112.18	102.82	107.49		107.21
Other International	121.68	109.52	108.00	109.95	110.75	112.18	102.82	107.49		107.21
Total consolidated operations	111.91	105.77	102.79	103.16	105.86	106.17	100.31	106.85		104.43
Equity affiliates	111.37	99.28	96.57	100.90	102.80	100.27	93.41	99.41		97.67
Total continuing operations	111.88	105.43	102.54	103.08	105.72	105.97	100.07	106.60		104.20
Discontinued operations (Algeria and Nigeria)	122.73	109.92	106.97	112.15	112.89	112.62	103.45	110.28		109.59
Total	112.33	105.56	102.72	103.33	105.98	106.20	100.14	106.74		104.37
NGL ($/BBL)										
Consolidated operations										
Lower 48	44.90	34.62	31.40	31.32	35.45	29.58	29.30	32.57		30.52
Canada	54.13	48.66	45.31	46.28	48.64	50.15	44.08	46.90		47.07
Norway	57.56	53.57	55.56	72.71	59.22	59.77	52.15	56.29		56.88
United Kingdom	61.10	56.38	59.72	74.83	63.84	60.61	46.32	58.58		55.53
Europe	59.29	54.81	57.62	73.94	61.53	60.10	49.29	57.36		56.28
Australia/Timor-Leste	88.97	70.98	74.68	85.00	80.03	77.42	67.48	71.92		72.94
Indonesia	90.85	72.30	63.40	84.60	77.58	78.10	64.58	69.97		70.96
AP/ME	89.96	71.39	71.06	84.68	79.26	77.59	66.54	71.35		72.38
Total consolidated operations	53.26	42.77	40.02	42.38	44.62	40.87	36.21	39.44		38.85
Equity affiliates	88.24	70.28	62.16	86.97	77.30	77.32	64.63	69.90		70.68
Total continuing operations	55.03	44.36	41.08	44.93	46.36	42.95	37.80	41.14		40.64
Discontinued operations (Nigeria)	11.97	15.34	14.26	11.06	13.30	12.30	13.13	15.76		13.97
Total	54.11	43.55	40.39	44.15	45.55	42.41	37.24	40.47		40.05
Bitumen ($/BBL)										
Consolidated operations	54.95	54.75	56.23	55.29	57.58	36.78	59.67	76.90		59.18
Equity affiliates	60.04	50.85	56.95	47.43	53.39	39.52	55.13	75.93		56.79
Total	60.66	51.38	56.86	48.32	53.91	39.23	55.69	76.06		57.08
Natural Gas ($/MCF)										
Consolidated operations										
Alaska	4.68	3.93	3.97	4.28	4.22	5.20	4.03	4.09		4.56
Lower 48	2.65	2.10	2.64	3.24	2.67	3.19	3.85	3.39		3.48
Canada	1.98	1.61	2.05	2.92	2.13	2.89	3.28	2.42		2.86
Norway	10.40	9.58	8.47	10.26	9.77	10.69	10.42	11.11		10.75
United Kingdom	9.80	9.49	9.06	10.72	9.76	10.87	10.19	10.12		10.42
Europe	9.98	9.52	8.87	10.56	9.76	10.81	10.26	10.48		10.53
Australia/Timor-Leste*	1.10	1.10	1.18	1.12	1.12	1.10	1.11	1.61		1.35
China	-	2.46	2.44	2.39	2.41	2.50	2.52	2.54		2.52
Indonesia	10.37	12.85	9.94	10.14	10.80	11.57	10.56	11.01		11.04
Vietnam	1.15	-	-	-	1.15	-	-	-		-
AP/ME**	10.40	11.47	10.64	10.15	10.63	11.20	10.62	10.61		10.87
Libya	0.09	0.09	6.77	5.19	5.55	4.86	4.65	5.92		5.20
Other International	0.09	0.09	6.77	5.19	5.55	4.86	4.65	5.92		5.20
Total consolidated operations**	5.20	4.72	4.86	5.50	5.07	5.75	5.88	5.49		5.71
Equity affiliates	8.62	8.88	8.66	7.90	8.54	9.36	8.84	9.35		9.18
Total continuing operations**	5.61	5.25	5.28	5.79	5.48	6.19	6.25	5.99		6.14
Discontinued operations (Nigeria)	2.53	2.51	2.84	2.32	2.57	2.54	2.98	2.58		2.71
Total**	5.49	5.14	5.18	5.69	5.38	6.09	6.15	5.88		6.04

Excludes transfers to Darwin LNG plant.

***First and second quarter of 2013 have been restated to reflect certain adjustments.*

ConocoPhillips

CORPORATE AND OTHER	2012 1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	YTD	2013 1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	YTD
Corporate and Other Earnings (Loss) ($ Millions)	(311)	(262)	(254)	(166)	(993)	(162)	(173)	(234)		(569)
Detail of Earnings (Loss) ($ Millions)										
Net interest expense	(161)	(160)	(214)	(113)	(648)	(108)	(127)	(124)		(359)
Corporate G&A expenses	(74)	(44)	(128)	(67)	(313)	(27)	(43)	(77)		(147)
Technology*	(18)	(22)	46	(10)	(4)	(8)	41	(26)		7
Separation costs	(33)	(40)	(7)	(4)	(84)	-	-	-		-
Other	(25)	4	49	28	56	(19)	(44)	(7)		(70)
Total	(311)	(262)	(254)	(166)	(993)	(162)	(173)	(234)		(569)
Before-Tax Net Interest Expense ($ Millions)										
Interest expense	(309)	(315)	(294)	(303)	(1,221)	(287)	(303)	(303)		(893)
Capitalized interest	146	145	157	167	615	179	186	172		537
Interest revenue	11	18	7	60	96	10	28	10		48
Premium on early debt retirement	-	-	(79)	-	(79)	-	-	-		-
Total	(152)	(152)	(209)	(76)	(589)	(98)	(89)	(121)		(308)
Debt										
Total debt ($ Millions)	28,360	23,008	21,117	21,725	21,725	21,670	21,721	21,668		21,668
Debt-to-capital ratio (%)	30%	33%	31%	31%	31%	31%	31%	30%		30%
Equity ($ Millions)	67,057	46,443	47,877	48,427	48,427	49,240	48,932	51,537		51,537

*Includes investment in new technologies or businesses outside of our normal scope of operations and is net of licensing revenues.

REFERENCE

Commonly Used Abbreviations

Earnings	Net Income (Loss) Attributable to ConocoPhillips
DD&A	Depreciation, Depletion and Amortization
FX	Foreign Currency
G&G	Geological and Geophysical
G&A	General and Administrative
JCC	Japan Crude Cocktail
LNG	Liquefied Natural Gas
NGL	Natural Gas Liquids
R&D	Research and Development
WCS	Western Canada Select
WTI	West Texas Intermediate

Units of Measure

BBL	Barrels
MMBBL	Millions of Barrels
MBD	Thousands of Barrels per Day
MBOED	Thousands of Barrels of Oil Equivalent per Day
MCF	Thousands of Cubic Feet
MMBTU	Millions of British Thermal Units
MMCFD	Millions of Cubic Feet per Day

EXXON MOBIL CORPORATION

3Q13 INVESTOR RELATIONS DATA SUMMARY (PAGE 1 of 4)

Earnings, $M	3Q13	2Q13	1Q13	4Q12	3Q12
Upstream					
United States	1,050	1,096	859	1,604	633
Non-U.S.	5,663	5,209	6,178	6,158	5,340
Total	6,713	6,305	7,037	7,762	5,973
Downstream					
United States	315	248	1,039	697	1,441
Non-U.S.	277	148	506	1,071	1,749
Total	592	396	1,545	1,768	3,190
Chemical					
United States	680	515	752	728	565
Non-U.S.	345	241	385	230	225
Total	1,025	756	1,137	958	790
Corporate and financing	(460)	(597)	(219)	(538)	(383)
Net income attributable to ExxonMobil (U.S. GAAP)	7,870	6,860	9,500	9,950	9,570
Earnings per common share (U.S. GAAP)	1.79	1.55	2.12	2.20	2.09
Earnings per common share - assuming dilution (U.S. GAAP)	1.79	1.55	2.12	2.20	2.09
Capital and Exploration Expenditures, $M					
Upstream					
United States	2,314	2,643	2,090	4,036	1,960
Non-U.S.	7,161	6,634	8,757	7,328	6,288
Total	9,475	9,277	10,847	11,364	8,248
Downstream					
United States	207	221	259	192	156
Non-U.S.	349	354	350	479	427
Total	556	575	609	671	583
Chemical					
United States	282	198	114	129	110
Non-U.S.	227	192	202	258	240
Total	509	390	316	387	350
Other	6	2	3	21	2
Total Capital and Exploration Expenditures	10,546	10,244	11,775	12,443	9,183
Exploration Expense Charged to Income, $M					
Consolidated - United States	129	69	127	101	105
- Non-U.S.	355	384	316	349	387
Non-consolidated - ExxonMobil share - United States	2	1	1	6	2
- Non-U.S.	108	223	1	2	5
Exploration Expenses Charged to Income Included Above	594	677	445	458	499
Effective Income Tax Rate, %	48%	51%	46%	46%	47%
Common Shares Outstanding (millions)					
At quarter end	4,369	4,402	4,446	4,502	4,559
Average - assuming dilution	4,395	4,433	4,485	4,541	4,597
Total Cash and Cash Equivalents ($G)[1]	5.7	5.0	6.6	9.9	13.3
Total Debt ($G)	21.3	19.4	13.4	11.6	12.4
Cash Flow from Operations and Asset Sales ($G)					
Net cash provided by operating activities	13.4	7.7	13.6	13.2	13.4
Proceeds associated with asset sales	0.2	0.3	0.4	0.8	0.6
Cash flow from operations and asset sales	13.6	8.0	14.0	14.0	14.0

[1] Includes restricted cash of $0.4G in 3Q13, $0.4G in 2Q13, $0.4G in 1Q13, $0.3G in 4Q12, and $0.2G in 3Q12

EXXON MOBIL CORPORATION

3Q13 INVESTOR RELATIONS DATA SUMMARY (PAGE 2 of 4)

Supplemental Information (continued)

Net production of crude oil, natural gas liquids, bitumen and synthetic oil, kbd	3Q13	2Q13	1Q13	4Q12	3Q12
United States	423	419	435	430	397
Canada / South America	273	264	264	268	247
Europe	175	197	195	205	181
Africa	497	472	453	479	492
Asia	778	778	804	776	744
Australia / Oceania	53	52	42	45	55
Total liquids production	2,199	2,182	2,193	2,203	2,116
Natural gas production available for sale, mcfd					
United States	3,557	3,581	3,590	3,747	3,712
Canada / South America	370	347	328	346	340
Europe	2,210	2,836	4,473	3,627	2,233
Africa	6	5	9	15	16
Asia	4,357	4,174	4,515	4,477	4,287
Australia / Oceania	414	411	298	329	473
Total natural gas production available for sale	10,914	11,354	13,213	12,541	11,061
Total worldwide liquids and gas production, koebd	4,018	4,074	4,395	4,293	3,960
Refinery throughput, kbd					
United States	1,896	1,745	1,810	1,856	1,841
Canada	451	435	430	468	449
Europe	1,496	1,400	1,394	1,499	1,547
Asia Pacific	810	771	790	823	813
Other Non-U.S.	194	115	152	191	279
Total refinery throughput	4,847	4,466	4,576	4,837	4,929
Petroleum product sales, kbd					
United States	2,667	2,525	2,532	2,737	2,576
Canada	477	470	436	470	499
Europe	1,543	1,527	1,460	1,537	1,601
Asia Pacific	903	835	894	896	874
Other Non-U.S.	441	408	433	468	555
Total petroleum product sales	6,031	5,765	5,755	6,108	6,105
Gasolines, naphthas	2,455	2,327	2,355	2,500	2,447
Heating oils, kerosene, diesel	1,887	1,791	1,792	1,881	1,897
Aviation fuels	482	469	453	487	495
Heavy fuels	419	431	460	499	502
Specialty products	788	747	695	741	764
Total petroleum product sales	6,031	5,765	5,755	6,108	6,105
Chemical prime product sales, kt					
United States	2,469	2,360	2,364	2,378	2,342
Non-U.S.	3,776	3,471	3,546	3,523	3,605
Total chemical prime product sales	6,245	5,831	5,910	5,901	5,947

EXXON MOBIL CORPORATION

3Q13 INVESTOR RELATIONS DATA SUMMARY (PAGE 3 of 4)

Supplemental Information (continued)

Earnings Factor Analysis, $M	3Q13 vs. 3Q12	3Q13 vs. 2Q13
Upstream		
Prior Period	5,973	6,305
Realization	440	410
Volume / Mix	20	-150
Other	280	150
Current Period	6,713	6,713
Downstream		
Prior Period	3,190	396
Margin	-2,370	-870
Volume / Mix	150	500
Other	-380	570
Current Period	592	592
Chemical		
Prior Period	790	756
Margin	240	110
Volume / Mix	10	60
Other	-15	100
Current Period	1,025	1,025

Upstream Volume Factor Analysis, KOEBD	
Prior Period	3,960	4,074
Entitlements - Net Interest	-13	-3
Entitlements - Price / Spend	-8	-4
Quotas	-	-
Divestments	-28	-5
Net Growth	107	-44
Current Period	4,018	4,018

Sources and Uses of Funds ($G)	3Q13
Beginning Cash	5.0
Earnings	7.9
Depreciation	4.3
Working Capital / Other	1.2
Proceeds Associated with Asset Sales	0.2
Additions to PP&E	-9.1
Shareholder Distributions	-5.8
Additional Financing / Investing	2.0
Ending Cash	5.7

Notes:
The 3Q13 beginning and ending balances include restricted cash of $0.4G and $0.4G, respectively.

EXXON MOBIL CORPORATION

3Q13 INVESTOR RELATIONS DATA SUMMARY (PAGE 4 of 4)

Supplemental Information (continued)

Average Realization Data	3Q13	2Q13	1Q13	4Q12	3Q12
United States					
ExxonMobil					
Crude ($/b)	101.73	95.97	98.05	92.19	96.36
Natural Gas ($/kcf)	3.31	3.95	3.21	3.17	2.65
Benchmarks					
WTI ($/b)	105.80	94.12	94.29	88.09	92.11
ANS-WC ($/b)	110.52	104.52	111.02	107.04	109.08
Henry Hub ($/mbtu)	3.58	4.10	3.34	3.41	2.80
Non-U.S.					
ExxonMobil					
Crude ($/b)	106.72	98.60	105.36	104.53	104.32
Natural Gas ($/kcf)	9.49	9.74	10.49	9.52	9.01
European NG ($/kcf)	10.26	10.09	10.52	10.20	9.28
Benchmarks					
Brent ($/b)	110.36	102.44	112.55	110.02	109.61

The above numbers reflect ExxonMobil's current estimate of volumes and realizations given data available as of the end of the third quarter of 2013. Volumes and realizations may be adjusted when full statements on joint venture operations are received from outside operators. ExxonMobil management assumes no duty to update these estimates.

ROYAL DUTCH SHELL PLC

3RD QUARTER 2013 UNAUDITED RESULTS

3RD QUARTER 2013

- Royal Dutch Shell's third quarter 2013 earnings, on a current cost of supplies (CCS) basis (see Note 1), were $4.2 billion compared with $6.2 billion in the same quarter a year ago.
- Third quarter 2013 CCS earnings excluding identified items (see page 5) were $4.5 billion compared with $6.6 billion in the third quarter of 2012.
- Compared with the third quarter 2012, CCS earnings excluding identified items were impacted by significantly weaker industry refining conditions, increased Upstream operating expenses and exploration expenses, as well as production volume impacts from maintenance and asset replacement activities. Earnings also reflected the impact of the challenging operating environment in Nigeria and lower dividends from an LNG venture. This was partly offset by higher contributions from Chemicals and increased underlying Upstream production volumes, led by Integrated Gas.

- Basic CCS earnings per share excluding identified items decreased by 32% versus the third quarter 2012.
- Cash flow from operating activities for the third quarter 2013 was $10.4 billion, compared with $9.5 billion in the same quarter last year. Excluding working capital movements, cash flow from operating activities for the third quarter 2013 was $9.9 billion, compared with $11.7 billion in the third quarter 2012.
- Capital investment for the third quarter 2013 was $9.7 billion. Net capital investment (see Note 1) for the quarter was $9.4 billion.
- Total dividends distributed in the quarter were $2.8 billion, of which $1.2 billion were settled under the Scrip Dividend Programme. During the third quarter some 45.5 million shares were bought back for cancellation for a consideration of $1.5 billion.
- Gearing at the end of the third quarter 2013 was 11.2%.
- A third quarter 2013 dividend has been announced of $0.45 per ordinary share and $0.90 per American Depositary Share ("ADS"), an increase of 5% compared with the third quarter 2012.

Quarters				$ million	Nine months		
Q3 2013	Q2 2013	Q3 2012[1]	%		2013	2012[1]	%
4,477	1,737	7,164	-38	Income attributable to shareholders	14,390	19,984	-28
(45)	687	(1,012)		Current cost of supplies (CCS) adjustment for Downstream	3	(171)	
4,432	2,424	6,152	-28	CCS earnings	14,393	19,813	-27
(2,071)	(2,206)	(1,412)		Less: identified items[2]	(7,554)	193	
6,503	4,630	7,564	-14	CCS earnings excluding identified items	21,947	19,620	12
				Of which:			
3,486	3,124	4,959		Upstream	13,480	15,706	
992	1,149	1,735		Downstream	3,906	4,153	
25	(643)	(66)		Corporate and Non-controlling interest	(3)	(239)	
10,809	12,444	9,483	-14	Cash flow from operating activities	34,412	35,257	-2
0.68	0.26	0.95	-28	Basic CCS earnings per share [3]	2.16	3.17	-32
1.35	0.78	1.90		Basic CCS earnings per ADS [3]	6.64	6.34	
0.77	0.70	1.05	-27	Basic CCS earnings per share excl. identified items [3]	2.63	3.14	-16
1.42	1.44	2.10		Basic CCS earnings per ADS excl. identified items [3]	8.26	6.26	
0.45	0.45	0.43	+5	Dividend per share [3]	1.35	1.29	+5
0.90	0.90	0.86		Dividend per ADS [3]	2.70	2.58	

[1] Restated for accounting policy change (see Note 2).
[2] CCS on CCS change. [3] See page 5.

Royal Dutch Shell Chief Executive Officer Peter Voser commented:

"Our cash flow pays for Shell's dividends and investment in new projects to ensure affordable and reliable energy supplies for our customers, and to add value for our shareholders.

We are facing headwinds from weak industry refining margins, and the security situation in Nigeria, which continue to erode the near term outlook.

Shell has a strong project flow in place for 2014 and beyond. We have started up a series of new oil and gas fields in the last few months, in deep water, integrated gas, and in our longer-term plays such as Iraq. These new fields are part of a project flow that will drive Shell's cash flow in 2014 and beyond, coming alongside a reduction in net spending next year as we work through a series of acquisitions, and increase the pace of asset sales.

The company is rich with new investment opportunities – in the next few quarters Shell's capital discipline means we will need to make hard choices between the best new investment opportunities from this industry-leading portfolio."

Voser concluded: "Shell's sustained investment in new growth projects will drive our financial performance. Dividends are Shell's main route for returning cash to shareholders. We have distributed more than $11 billion of dividends in the last 12 months. So far this year, we have repurchased more than $4 billion of shares, and we are on track for up to $5 billion of share buybacks in 2013. This underlines our commitment to shareholder returns."

THIRD QUARTER 2013 PORTFOLIO DEVELOPMENTS

Upstream

In **Iraq**, Shell successfully restarted production at Majnoon (Shell interest 45%) and expects to progressively increase production to the First Commercial Production level of 175 thousand barrels of oil per day ("b/d").

In the **United States**, Shell acquired an additional 33% interest in the 10 thousand barrels of oil equivalent per day ("boe/d") Coulomb North field in the Gulf of Mexico, giving Shell a 100% interest.

As part of its global exploration programme Shell added **new acreage** positions during the third quarter 2013, including offshore positions in China and in the Gulf of Mexico, United States.

In **Australia**, the North Rankin Redevelopment project achieved start-up in October. The project, which is part of the North West Shelf project (Shell direct and indirect interest 20.5%) enables the recovery of low pressure reserves from the North Rankin and Perseus fields.

In **Brazil**, Shell commenced production from the BC-10 Phase 2 project in October. The project is expected to produce 35 thousand boe/d at peak. Shell also exercised preferential rights to acquire an additional 23% interest in the BC-10 project. Subject to regulatory approvals, the transaction is expected to close end 2013 or early 2014, increasing Shell's interest from 50% to 73%.

Also in October, a consortium of companies in which Shell holds a 20% interest won a 35-year production sharing contract to develop the Libra pre-salt oil discovery located in the Santos Basin, offshore **Brazil**. The Brazilian regulator ANP estimates Libra's recoverable resources to be between 8 and 12 billion barrels of oil and estimates that total gross peak oil production could reach 1.4 million b/d. Further appraisal is required to firm up this estimate, the development concept and a first oil date. As part of the winning bid, Shell expects to pay some $1.4 billion as its share of the signature bonus during the fourth quarter of 2013.

In **Canada**, Shell took the final investment decision for Phase 1 and 2 of the Carmon Creek In-situ project (Shell interest 100%). The project will include central processing facilities and well pads with peak annual production of 80 thousand barrels of bitumen production per day, with an expected field life of decades.

Downstream

Shell divested the majority of its shareholding in its downstream business in **Ghana**.

KEY FEATURES OF THE THIRD QUARTER 2013

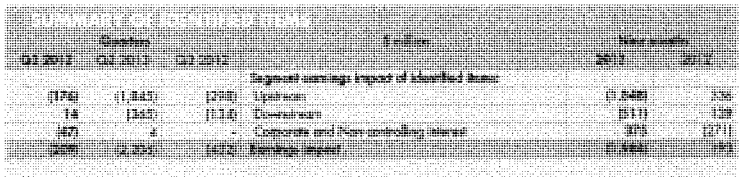
- **Third quarter 2013 CCS earnings** (see Note 1) were $4,248 million, 31% lower than for the same quarter a year ago.
- **Third quarter 2013 CCS earnings excluding identified items** (see page 5) were $4,457 million compared with $6,584 million in the third quarter 2012, a decrease of 32%. Third quarter 2013 CCS earnings excluding identified items were impacted by significantly weaker refining industry conditions, increased Upstream operating expenses and exploration expenses, as well as production volume impacts from maintenance and asset replacement activities. Earnings also reflected the impact of the challenging operating environment in Nigeria and lower dividends from an LNG venture. This was partly offset by higher contributions from Chemicals and increased underlying Upstream production volumes, led by Integrated Gas.
- **Basic CCS earnings per share** decreased by 31% versus the same quarter a year ago.
- **Basic CCS earnings per share excluding identified items** decreased by 32% versus the same quarter a year ago.
- **Cash flow from operating activities** for the third quarter 2013 was $10.4 billion, compared with $9.5 billion in the same quarter last year. Excluding working capital movements, cash flow from operating activities for the third quarter 2013 was $9.9 billion, compared with $11.7 billion in the same quarter last year.
- **Net capital investment** (see Note 1) for the third quarter 2013 was $9.4 billion. **Capital investment** for the third quarter 2013 was $9.7 billion and **divestment proceeds** were $0.3 billion. Net capital investment for the full year 2013 is expected to be around $45 billion, including some $3 billion of non-cash items. These estimates include some $10 billion of announced acquisitions, including the impact of the agreement to acquire part of Repsol's LNG portfolio, our pre-emption for an additional interest in the BC-10 project and the entry into the Libra discovery, both in deepwater in Brazil. The final outcome for the year will be determined by the timing of completion of these transactions, and Shell's asset sales programme.
- Total **dividends distributed** in the third quarter 2013 were $2.8 billion, of which $1.2 billion were settled by issuing some 39.1 million A shares under the Scrip Dividend Programme for the second quarter 2013.
- Under our **share buyback programme** some 45.5 million B shares were bought back for cancellation during the third quarter 2013 for a consideration of $1.5 billion.
- **Return on average capital employed** (see Note 9) on a reported income basis was 10.4% at the end of the third quarter 2013 compared with 13.5% at the end of the third quarter 2012 (see Note 2).
- **Gearing** was 11.2% at the end of the third quarter 2013 versus 9.1% at the end of the third quarter 2012 (see Note 2).
- **Oil and gas production** for the third quarter 2013 was 2,931 thousand boe/d, a decrease of 2% compared with the third quarter 2012. The deteriorated operating environment in Nigeria impacted production volumes by some 65 thousand boe/d compared with the third quarter 2012. Excluding the impact of the deteriorated operating environment in Nigeria, divestments and PSC price effects, third quarter 2013 production volumes were 1% higher than in the same period last year. Production volumes were also impacted by higher maintenance and asset replacement activities.
- **Equity LNG** sales volumes of 4.88 million tonnes for the third quarter 2013 were 2% lower than in the same quarter a year ago. Excluding the impact of the challenging operating environment in Nigeria, equity LNG sales volumes were 4% higher than in the third quarter 2012.
- **Oil products sales volumes** for the third quarter 2013 were 2% higher than for the third quarter 2012. **Chemicals sales volumes** for the third quarter 2013 decreased by 2% compared with the same quarter a year ago.

- **Comparative information** in this Report has been restated following the adoption of revised IAS 19 *Employee Benefits* on January 1, 2013, with retrospective effect (see Note 2). Comparative information was not restated for other accounting policy changes (see Note 1) for which the impacts are not significant, including the adoption of IFRS 11 *Joint Arrangements* on January 1, 2013, which results in certain previously equity-accounted entities now in effect being proportionately consolidated.
- **Supplementary financial and operational disclosure** for the third quarter 2013 is available at www.shell.com/investor.

SUMMARY OF IDENTIFIED ITEMS

Earnings for the third quarter 2013 reflected the following items, which in aggregate amounted to a net charge of $209 million (compared with a net charge of $432 million in the third quarter 2012), as summarised in the table below:

- **Upstream** earnings included a net charge of $176 million, reflecting impairments of $234 million, predominantly related to various offshore properties in North America. This was partly offset by the net impact of fair value accounting of commodity derivatives and certain gas contracts of $20 million and a net gain of $38 million from other items. Other items mainly reflected a credit related to statutory tax rate reductions. Upstream earnings for the third quarter 2012 included a net charge of $298 million.
- **Downstream** earnings included a net gain of $14 million, reflecting the net impact of fair value accounting of commodity derivatives of $72 million and net divestment gains of $42 million. This was partly offset by impairments of $24 million and a net charge of $76 million from other items. Other items mainly reflected a write-off of a deferred tax asset, partly offset by a credit related to statutory tax rate reductions. Downstream earnings for the third quarter 2012 included a net charge of $134 million.
- **Corporate results and Non-controlling interest** included a net charge of $47 million, mainly reflecting an adjustment of a tax receivable, partly offset by a credit related to statutory tax rate reductions. Earnings for the third quarter 2012 did not include any identified items.

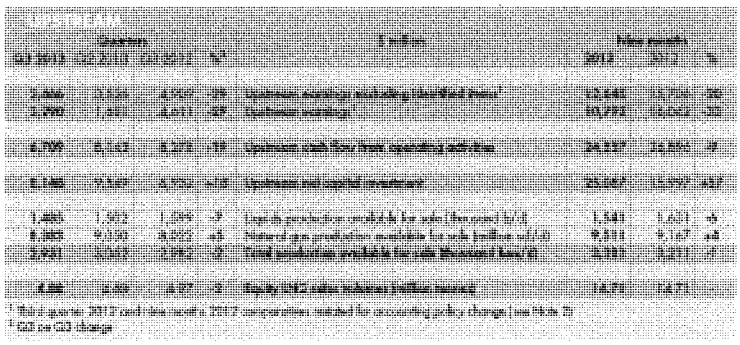


These identified items are shown to provide additional insight into segment earnings and income attributable to shareholders. From the first quarter 2013 onwards, identified items include the full impact on Shell's CCS earnings of the following items:

- Divestment gains and losses
- Impairments
- Fair value accounting of commodity derivatives and certain gas contracts (see Note 8)
- Redundancy and restructuring

Further items may be identified in addition to the above. Prior period comparatives have not been restated.

EARNINGS BY BUSINESS SEGMENT



Third quarter Upstream earnings excluding identified items were $3,466 million compared with $4,909 million a year ago. Identified items were a net charge of $176 million, compared with a net charge of $298 million in the third quarter 2012 (see page 5).

Third quarter 2013 Upstream earnings excluding identified items were reduced by some $300 million due to the impact of the deteriorated security situation onshore Nigeria and a blockade of Nigeria LNG. In comparison, the third quarter 2012 included an additional dividend from an LNG venture of some $200 million.

Compared with the third quarter 2012, earnings were also impacted by higher operating expenses, higher exploration expenses, maintenance activities and increased depreciation. LNG realisations and gas realisations outside of the Americas were lower. Earnings benefited from the ramp-up of Pearl GTL in Integrated Gas and, in the Americas, higher liquids realisations and increased production volumes from liquids-rich shale properties.

Upstream operating expenses included higher feasibility expenses for projects in the pre-final investment decision stage, higher decommissioning and restoration costs and increased maintenance costs. Exploration expenses increased mainly due to exploration well write-offs.

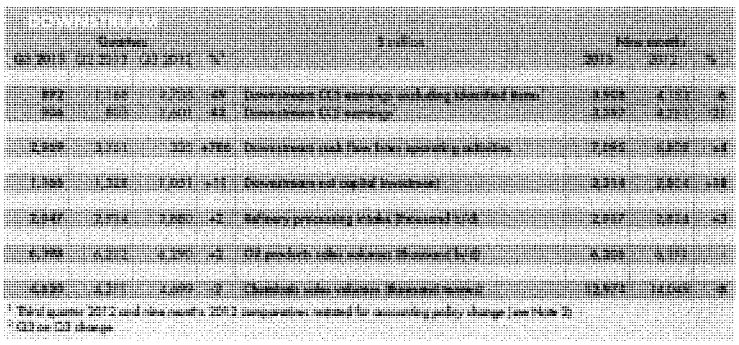
Upstream Americas excluding identified items continued to incur a loss.

Global liquids realisations were 2% lower than for the third quarter 2012. In Canada, synthetic crude oil realisations were 26% higher than for the same period last year. Global natural gas realisations were 2% lower than for the same quarter a year ago, with a 22% increase in the Americas and a 5% decrease outside the Americas.

Third quarter 2013 production was 2,931 thousand boe/d compared with 2,982 thousand boe/d a year ago. Liquids production decreased by 7% and natural gas production increased by 5% compared with the third quarter 2012. The deteriorated operating environment in Nigeria impacted production volumes by some 65 thousand boe/d compared with the third quarter 2012. Excluding the impact of the deteriorated operating environment in Nigeria, divestments and PSC price effects, third quarter 2013 production was 1% higher than for the same period last year. Production volumes were also impacted by some 60 thousand boe/d compared with the third quarter 2012 due to higher maintenance and asset replacement activities.

New field start-ups and the continuing ramp-up of existing fields, in particular Pearl GTL in Qatar and Eagle Ford in the United States, contributed some 180 thousand boe/d to production for the third quarter 2013, which more than offset the impact of field declines.

Equity LNG sales volumes of 4.88 million tonnes decreased by 2% compared with the same quarter a year ago, reflecting lower volumes from Nigeria LNG, partly offset by better operating performance at various other LNG plants. Shell-share Nigeria LNG volumes were some 0.28 million tonnes lower in the third quarter 2013 due to reduced feedgas supply, as a result of the deteriorated security situation onshore, and due to a blockade of Nigeria LNG operations by the Nigerian Maritime Administration and Safety Agency in July. Excluding the impact of the challenging operating environment in Nigeria, equity LNG sales volumes were 4% higher than in the third quarter 2012.



Third quarter Downstream earnings excluding identified items were $892 million compared with $1,735 million for the third quarter 2012. Identified items were a net gain of $14 million, compared with a net charge of $134 million for the third quarter 2012 (see page 5).

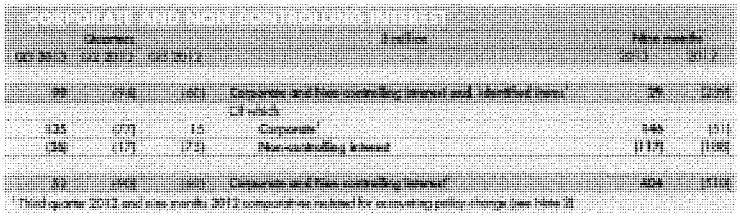
Compared with the third quarter 2012, Downstream earnings excluding identified items benefited from increased contributions from Chemicals and Oil Products retail, reflecting strong performance from these businesses. This was more than offset by significantly lower realised refining margins as well as lower contributions from trading.

Realised refining margins reflected significantly weaker refining industry conditions in all regions due to structural global overcapacity and weak demand. Contributions from refineries in North America were also impacted by the narrowing price differential between North American crude oil markers and the Brent crude oil marker, as well as maintenance activities. Contributions from Chemicals increased as a result of strong operating performance in all regions and improved industry conditions in the United States and Europe.

Oil products sales volumes increased by 2% compared with the same period a year ago, mainly as a result of increased trading volumes and an accounting policy change (see Note 1b), partly offset by lower marketing volumes.

Chemicals sales volumes decreased by 2% compared with the same quarter last year, mainly as a result of an accounting policy change (see Note 1b) and contract expirations, partly offset by higher trading volumes. Chemicals manufacturing plant availability increased to 96% from 89% for the third quarter 2012, as a result of strong operating performance and lower planned maintenance.

Refinery intake volumes were 2% higher compared with the same quarter last year, mainly as a result of an accounting policy change (see Note 1b). Refinery availability was 93%, compared with 92% for the third quarter 2012.



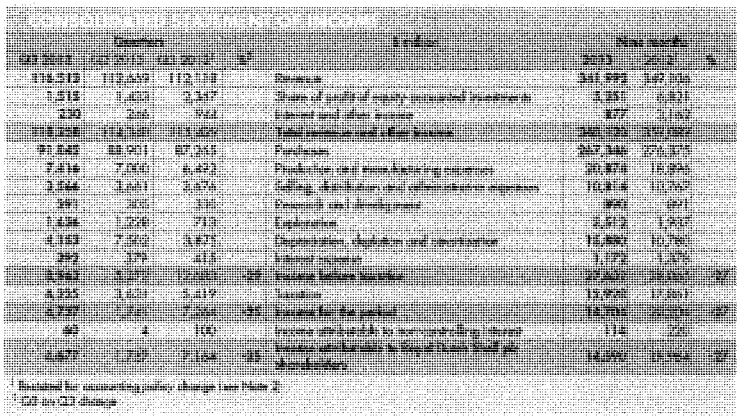
Third quarter Corporate results and Non-controlling interest excluding identified items were a gain of $99 million, compared with a loss of $60 million in the same period last year. Identified items for the third quarter 2013 were a net charge of $47 million, whereas earnings for the third quarter 2012 did not include any identified items (see page 5).

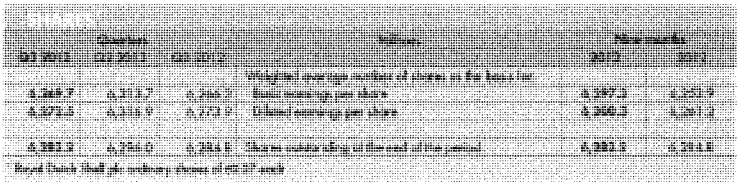
Compared with the third quarter 2012, Corporate results excluding identified items mainly reflected lower net interest expense and lower costs.

FORTHCOMING EVENTS

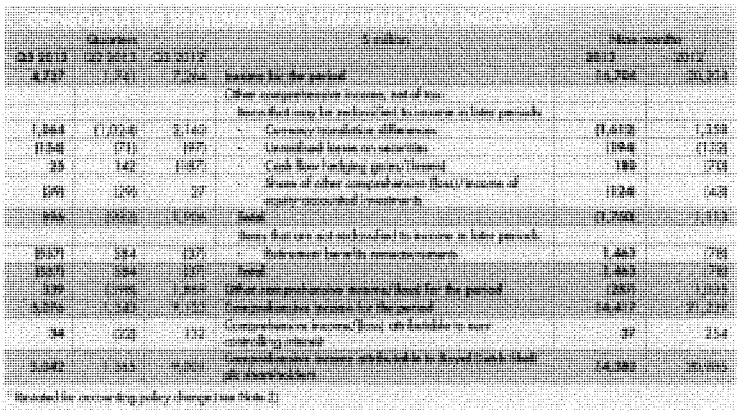
Fourth quarter 2013 results and fourth quarter 2013 dividend are scheduled to be announced on January 30, 2014. First quarter 2014 results and first quarter 2014 dividend are scheduled to be announced on May 1, 2014. Second quarter 2014 results and second quarter 2014 dividend are scheduled to be announced on July 31, 2014. Third quarter 2014 results and third quarter 2014 dividend are scheduled to be announced on October 30, 2014.

UNAUDITED CONDENSED CONSOLIDATED INTERIM FINANCIAL STATEMENTS

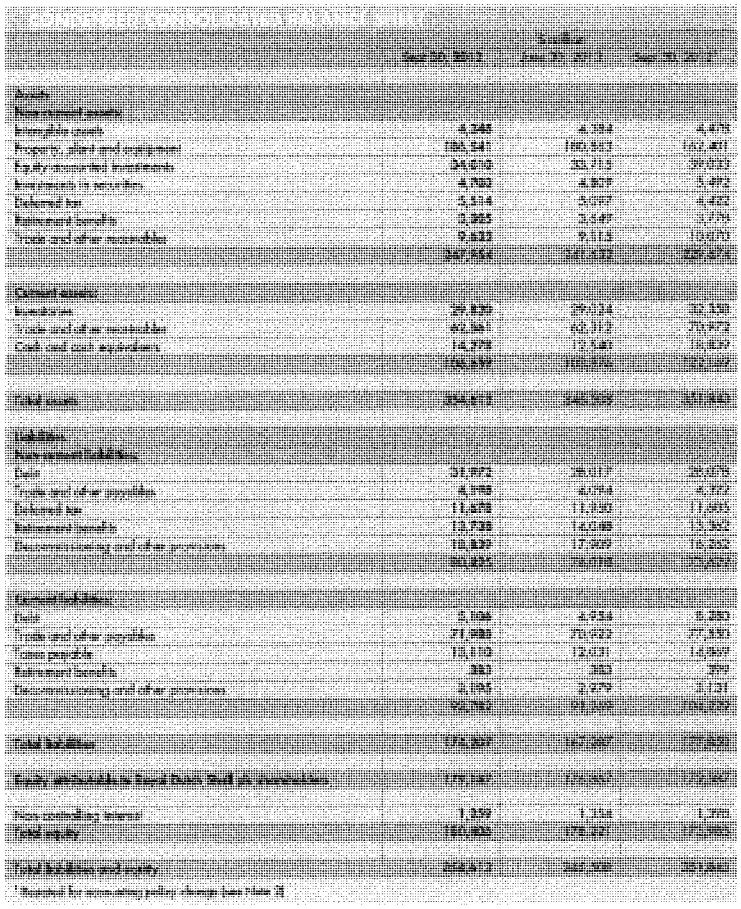




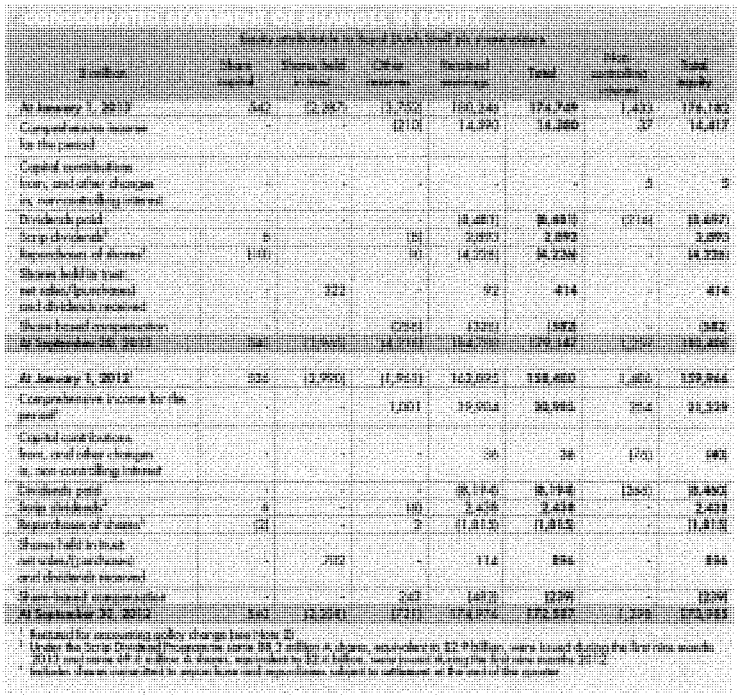
Notes 1 to 10 are an integral part of these Condensed Consolidated Interim Financial Statements.



Notes 1 to 10 are an integral part of these Condensed Consolidated Interim Financial Statements.



Notes 1 to 10 are an integral part of these Condensed Consolidated Interim Financial Statements



Notes 1 to 10 are an integral part of these Condensed Consolidated Interim Financial Statements.

Quarter				Nine months	
			Cash flow from operating activities		
4,727	1,741	7,254	Income for the period	14,754	22,254
			Adjustment for:		
4,960	4,048	5,385	- Current taxation	13,925	16,754
284	301	362	- Interest expense (net)	1,013	1,219
4,158	7,502	5,875	- Depreciation, depletion and amortization	15,830	16,781
(28)	(44)	(458)	- Net gains on sale of assets	(99)	(2,164)
881	4,065	(2,254)	- Decrease (increase) in working capital	4,670	1,387
(1,518)	(1,431)	(2,367)	- Share of profit of equity-accounted investments	(5,251)	(6,821)
1,807	2,703	1,537	- Dividends received from equity-accounted investments	5,232	7,918
(827)	(843)	(100)	- Deferred taxation, retirement benefits, decommissioning and other provisions	(1,752)	767
788	784	(205)	- Other	1,599	(355)
14,944	18,826	14,773	Net cash from operating activities (see below)	49,715	57,977
(6,956)	(6,599)	(4,621)	Taxation paid	(18,299)	(14,693)
7,988	12,227	10,152	Net cash from operating activities	31,416	43,284
			Cash flow from investing activities		
(8,788)	(8,987)	(8,411)	Capital expenditure	(25,639)	(21,912)
(358)	(291)	(780)	Investments in equity-accounted investments	(1,345)	(2,511)
78	219	316	Proceeds from sales of assets	780	4,317
312	42	56	Proceeds from sales of equity-accounted investments	427	383
(58)	(247)	(25)	Other investments (net)	(390)	(54)
31	79	67	Interest received	138	140
(8,781)	(9,175)	(8,777)	Net cash used in investing activities	(26,029)	(19,637)
			Cash flow from financing activities		
134	(376)	167	Net proceeds (payments) in debt with maturity period within three months	(113)	302
4,402	198	2,861	Other debt: New borrowings	6,780	3,295
(670)	(3,550)	(1,182)	Repayments	(6,413)	(4,447)
(223)	(179)	(352)	Interest paid	(657)	(1,142)
8	8	(10)	Change in non-controlling interest	9	12
			Cash dividends paid to:		
(1,637)	(2,043)	(1,973)	- Royal Dutch Shell plc shareholders	(5,599)	(5,764)
(156)	(59)	(164)	- Non-controlling interest	(216)	(264)
(1,939)	(1,954)	(1,449)	Repurchases of shares	(4,064)	(1,839)
(189)	(102)	908	Shares held in trust: net (purchases) sales and dividends received	(631)	9
57	(6,057)	806	Net cash used in financing activities	(10,885)	(10,226)
108	18	278	Currency translation differences relating to cash and cash equivalents	(156)	117
(628)	(6,012)	2,409	Increase (decrease) in cash and cash equivalents	(5,254)	13,538
19,280	19,908	17,896	Cash and cash equivalents at beginning of period	24,556	17,767
18,652	13,896	20,305	Cash and cash equivalents at end of period	19,302	31,305

Restated for accounting policy change (see Note 2)

Notes 1 to 10 are an integral part of these Condensed Consolidated Interim Financial Statements.

NOTES TO THE CONDENSED CONSOLIDATED INTERIM FINANCIAL STATEMENTS

1. Basis of preparation

These Condensed Consolidated Interim Financial Statements ("Interim Statements") of Royal Dutch Shell plc and its subsidiaries (collectively known as Shell) have been prepared in accordance with IAS 34 *Interim Financial Reporting* as adopted by the European Union and as issued by the International Accounting Standards Board and on the basis of the same accounting principles as, and should be read in conjunction with, the Annual Report and Form 20-F for the year ended December 31, 2012 (pages 103 to 108) as filed with the U.S. Securities and Exchange Commission, except as described below:

a) Revised IAS 19 *Employee Benefits* was adopted on January 1, 2013, with retrospective effect (see Note 2).

b) IFRS 10 *Consolidated Financial Statements*, IFRS 11 *Joint Arrangements* and revised standards IAS 27 *Separate Financial Statements* and IAS 28 *Investments in Associates and Joint Ventures* were adopted on January 1, 2013. The standards reinforce the principles for determining when an investor controls another entity and in certain cases amend the accounting for arrangements where an investor has joint control. The impact of the changes on the accounting for Shell's interests is not significant, hence comparative information was not restated; the major investments affected are listed in Note 7.

c) IFRS 13 *Fair Value Measurement* was adopted on January 1, 2013, with prospective effect. The standard affects nearly all instances where assets and liabilities are currently recognised at fair value, primarily by refining the measurement concept to represent an asset or liability's exit value. The standard also introduces certain additional considerations to the measurement process and additional disclosures have been provided where considered material (see Note 6). The impact of the changes for Shell is not significant.

The financial information presented in the Interim Statements does not constitute statutory accounts within the meaning of section 434(3) of the Companies Act 2006. Statutory accounts for the year ended December 31, 2012 were published in Shell's Annual Report and a copy delivered to the Registrar of Companies in England and Wales. The auditors' report on those accounts was unqualified, did not include a reference to any matters to which the auditors drew attention by way of emphasis without qualifying the report and did not contain a statement under sections 498(2) or (3) of the Companies Act 2006.

The Interim Statements are unaudited.

Segment information

Segment earnings (see Note 3) are presented on a current cost of supplies basis (CCS earnings). On this basis, the purchase price of volumes sold during the period is based on the current cost of supplies during the same period after making allowance for the tax effect. CCS earnings therefore exclude the effect of changes in the oil price on inventory carrying amounts.

Net capital investment (see Note 10) is defined as capital expenditure as reported in the Condensed Consolidated Statement of Cash Flows, adjusted for: proceeds from disposals (excluding those in the Corporate segment relating to other investments); exploration expense excluding exploration wells written off; investments in equity-accounted investments; and leases and other items.

CCS earnings and net capital investment information are the dominant measures used by the Chief Executive Officer for the purposes of making decisions about allocating resources and assessing performance.

2. Accounting for defined benefit plans

Revised IAS 19 *Employee Benefits* (IAS 19R) was adopted on January 1, 2013, with retrospective effect; comparative information is therefore restated.

The revised standard requires immediate recognition of actuarial gains and losses and return on assets arising in connection with defined benefit plans through other comprehensive income (see page 10). Previously, Shell applied the corridor method of accounting under which amounts falling inside the corridor remained unrecognised, while amounts falling outside it were recognised (amortised) in income over a number of years. For the periods presented in this Report, the elimination of this amortisation is approximately offset by lower interest income being recognised in income under the IAS 19R "net interest" approach. Under this approach, interest income from defined benefit plan assets is determined based on the same discount rate as applied to measure plan obligations, rather than on an expected rate of return reflecting the plan's investment portfolio.

The following table sets out the impact of the change on relevant lines in the Condensed Consolidated Balance Sheet, on gearing, and on the return on average capital employed (ROACE, see Note 9) for the twelve months ending at the respective balance sheet date.

$ million	Dec 31, 2012			Sept 30, 2012		
	As previously stated	Effect of accounting policy change	Restated	As previously stated	Effect of accounting policy change	Restated
Non-current assets						
Deferred tax	4,045	243	**4,288**	4,246	176	**4,422**
Retirement benefits	12,575	(10,274)	**2,301**	12,461	(8,683)	**3,778**
Non-current liabilities						
Deferred tax	15,590	(5,278)	**10,312**	16,107	(4,502)	**11,605**
Retirement benefits	6,298	8,992	**15,290**	6,169	7,193	**13,362**
Total equity						
Other reserves	10,021	(13,773)	**(3,752)**	10,448	(11,169)	**(721)**
Retained earnings	180,218	28	**180,246**	175,005	(29)	**174,976**
Gearing[1]	**9.2%**	**0.6%**	**9.8%**	**8.6%**	**0.5%**	**9.1%**
ROACE	**12.7%**	**0.9%**	**13.6%**	**12.9%**	**0.6%**	**13.5%**

[1] Net debt (total debt less cash and cash equivalents) as a percentage of total capital (net debt plus total equity)

The effect of the accounting policy change at January 1, 2012 was to reduce Accumulated other comprehensive income (within Other reserves) by $10,945 million, Retained earnings by $92 million and Total equity by $11,037 million.

Income for the third quarter 2012 increased by $25 million, of which Upstream segment earnings increased by $21 million and Downstream segment earnings increased by $4 million. There was no impact on basic and diluted earnings per share for the third quarter 2012 nor on net cash from operating activities.

Income for the first nine months 2012 increased by $63 million of which Upstream segment earnings increased by $58 million and Downstream segment earnings increased by $5 million. Basic and diluted earnings per share for the first nine months 2012 increased by $0.01. There was no impact on net cash from operating activities.

3. Information by business segment

Quarters		$ million	Nine months	
Q3 2013	Q3 2012[1]		2013	2012[1]
		Third-party revenue		
11,563	10,028	Upstream	36,024	32,066
104,914	102,075	Downstream	305,857	317,000
36	15	Corporate	111	40
116,513	112,118	**Total third-party revenue**	341,992	349,106
		Inter-segment revenue		
11,569	12,338	Upstream	34,064	38,337
76	172	Downstream	477	555
-	-	Corporate	-	-
		Segment earnings		
3,290	4,611	Upstream[2]	10,792	16,042
906	1,601	Downstream	3,397	4,281
88	15	Corporate	506	(285)
4,284	6,227	**Total segment earnings**	14,695	20,038

[1] Restated for accounting policy change (see Note 2)
[2] Second quarter 2013 Upstream earnings included an impairment charge of $2,071 million after taxation ($3,267 million before taxation)

Quarters		$ million	Nine months	
Q3 2013	Q3 2012[1]		2013	2012[1]
4,284	6,227	**Total segment earnings**	14,695	20,038
		Current cost of supplies adjustment:		
541	1,130	Purchases	(140)	160
(137)	(294)	Taxation	53	(51)
49	201	Share of profit of equity-accounted investments	96	57
4,737	7,264	**Income for the period**	14,704	20,204

[1] Restated for accounting policy change (see Note 2)

4. Share capital

Issued and fully paid

	Ordinary shares of €0.07 each		Sterling deferred
Number of shares	A	B	shares of £1 each
At January 1, 2013	3,772,388,687	2,617,715,189	50,000
Scrip dividends	88,288,316	-	-
Repurchases of shares	-	(117,715,539)	-
At September 30, 2013	**3,860,677,003**	**2,499,999,650**	**50,000**

Nominal value

	Ordinary shares		
$ million	A	B	Total
At January 1, 2013	321	221	542
Scrip dividends	8	-	8
Repurchases of shares	-	(10)	(10)
At September 30, 2013	**329**	**211**	**540**

The total nominal value of sterling deferred shares is less than $1 million.

At Royal Dutch Shell plc's Annual General Meeting on May 21, 2013, the Board was authorised to allot ordinary shares in Royal Dutch Shell plc, and to grant rights to subscribe for or to convert any security into ordinary shares in Royal Dutch Shell plc, up to an aggregate nominal amount of €148 million (representing approximately 2,114 million ordinary shares of €0.07 each), and to list such shares or rights on any stock exchange. This authority expires at the earlier of the close of business on August 21, 2014 and the end of the Annual General Meeting to be held in 2014, unless previously renewed, revoked or varied by Royal Dutch Shell plc in a general meeting.

5. Other reserves

$ million	Merger reserve[1]	Share premium reserve[1]	Capital redemption reserve[2]	Share plan reserve	Accumulated other comprehensive income	Total
At January 1, 2013[3]	3,423	154	63	2,028	(9,420)	**(3,752)**
Other comprehensive loss attributable to Royal Dutch Shell plc shareholders	-	-	-	-	(210)	**(210)**
Scrip dividends	(8)	-	-	-	-	**(8)**
Repurchases of shares	-	-	10	-	-	**10**
Share-based compensation	-	-	-	(256)	-	**(256)**
At September 30, 2013	**3,415**	**154**	**73**	**1,772**	**(9,630)**	**(4,216)**
At January 1, 2012[3]	3,432	154	60	1,571	(7,178)	**(1,961)**
Other comprehensive income attributable to Royal Dutch Shell plc shareholders[3]	-	-	-	-	1,001	**1,001**
Scrip dividends	(6)	-	-	-	-	**(6)**
Repurchases of shares	-	-	2	-	-	**2**
Share-based compensation	-	-	-	243	-	**243**
At September 30, 2012[3]	**3,426**	**154**	**62**	**1,814**	**(6,177)**	**(721)**

[1] The merger reserve and share premium reserve were established as a consequence of Royal Dutch Shell plc becoming the single parent company of Royal Dutch Petroleum Company and The "Shell" Transport and Trading Company, plc, now The Shell Transport and Trading Company Limited, in 2005.
[2] The capital redemption reserve was established in connection with repurchases of shares of Royal Dutch Shell plc.
[3] Restated for accounting policy change (see Note 2)

6. Derivative contracts

The table below provides the carrying amounts of derivative contracts held, disclosed in accordance with IFRS 13 *Fair Value Measurement* (see Note 1c).

$ million	Sept 30, 2013	June 30, 2013	Sept 30, 2012
Included within:			
Trade and other receivables – non-current	**1,683**	1,337	1,462
Trade and other receivables – current	**7,218**	8,174	12,088
Trade and other payables – non-current	**583**	583	735
Trade and other payables – current	**7,200**	7,834	12,350

7. Major investments in joint ventures and associates

Of the major investments in joint ventures and associates listed in the Annual Report and Form 20-F for the year ended December 31, 2012 (page 117), Aera, Deer Park and Saudi Aramco Shell Refinery have been assessed as joint operations under IFRS 11 *Joint Arrangements* (see Note 1b) and are no longer accounted for using the equity method as from January 1, 2013.

8. Impacts of accounting for derivatives

In the ordinary course of business Shell enters into contracts to supply or purchase oil and gas products, and also enters into derivative contracts to mitigate resulting economic exposures (generally price exposure). Derivative contracts are carried at period-end market price (fair value), with movements in fair value recognised in income for the period. Supply and purchase contracts entered into for operational purposes are, by contrast, recognised when the transaction occurs (see also below); furthermore, inventory is carried at historical cost or net realisable value, whichever is lower.

As a consequence, accounting mismatches occur because: (a) the supply or purchase transaction is recognised in a different period; or (b) the inventory is measured on a different basis.

In addition, certain UK gas contracts held by Upstream are, due to pricing or delivery conditions, deemed to contain embedded derivatives or written options and are also required to be carried at fair value even though they are entered into for operational purposes.

The accounting impacts of the aforementioned are reported as identified items in this Report.

9. Return on average capital employed

Return on average capital employed (ROACE) measures the efficiency of Shell's utilisation of the capital that it employs and is a common measure of business performance. In this calculation, ROACE is defined as the sum of income for the current and previous three quarters, adjusted for after-tax interest expense, as a percentage of the average capital employed for the same period. Capital employed consists of total equity, current debt and non-current debt. The tax rate is derived from calculations at the published segment level.

10. Liquidity and capital resources

Third quarter net cash from operating activities was $10.4 billion compared with $9.5 billion for the same period last year.

Total current and non-current debt increased to $37.1 billion at September 30, 2013 from $33.0 billion at June 30, 2013 while cash and cash equivalents increased to $14.3 billion at September 30, 2013, from $12.5 billion at June 30, 2013. During the third quarter 2013 Shell issued $3.75 billion of debt under the US shelf registration. No new debt was issued under the euro medium-term note programme.

Net capital investment in the third quarter 2013 was $9.4 billion, of which $8.1 billion was in Upstream, $1.2 billion in Downstream and $0.1 billion in Corporate. Net capital investment in the same period of 2012 was $8.0 billion, of which $6.9 billion was in Upstream and $1.1 billion in Downstream.

Dividends of $0.45 per share are announced on October 31, 2013 in respect of the third quarter. These dividends are payable on December 23, 2013. In the case of the B shares, the dividends will be payable through the dividend access mechanism and are expected to be treated as UK-source rather than Dutch-source. See the Annual Report and Form 20-F for the year ended December 31, 2012 for additional information on the dividend access mechanism.

Under the Scrip Dividend Programme shareholders can increase their shareholding in Shell by choosing to receive new shares instead of cash dividends. Only new A shares will be issued under the Programme, including to shareholders who currently hold B shares.

Nine months net cash from operating activities was $34.4 billion compared with $36.2 billion for the same period last year.

Total current and non-current debt decreased to $37.1 billion at September 30, 2013 from $37.8 billion at December 31, 2012 while cash and cash equivalents decreased to $14.3 billion at September 30, 2013, from $18.6 billion at December 31, 2012. During the first nine months 2013 Shell issued $3.75 billion of debt under the US shelf registration. No new debt was issued under the euro medium-term note programme.

Net capital investment in the first nine months 2013 was $28.5 billion, of which $25.1 billion was in Upstream, $3.3 billion in Downstream and $0.1 billion in Carporate. Net capital investment in the same period of 2012 was $18.9 billion, of which $16.0 billion was in Upstream, $2.8 billion in Downstream and $0.1 billion in Corporate.

CAUTIONARY STATEMENT

All amounts shown throughout this Report are unaudited.

The companies in which Royal Dutch Shell plc directly and indirectly owns investments are separate entities. In this document "Shell", "Shell group" and "Royal Dutch Shell" are sometimes used for convenience where references are made to Royal Dutch Shell plc and its subsidiaries in general. Likewise, the words "we", "us" and "our" are also used to refer to subsidiaries in general or to those who work for them. These expressions are also used where no useful purpose is served by identifying the particular company or companies. "Subsidiaries", "Shell subsidiaries" and "Shell companies" as used in this document refer to companies over which Royal Dutch Shell plc either directly or indirectly has control. Companies over which Shell has joint control are generally referred to as "joint ventures" and companies over which Shell has significant influence but neither control nor joint control are referred to as "associates". In this document, joint ventures and associates may also be referred to as "equity-accounted investments". The term "Shell interest" is used for convenience to indicate the direct and/or indirect (for example, through our 23% shareholding in Woodside Petroleum Ltd.) ownership interest held by Shell in a venture, partnership or company, after exclusion of all third-party interest.

This document contains forward-looking statements concerning the financial condition, results of operations and businesses of Royal Dutch Shell. All statements other than statements of historical fact are, or may be deemed to be, forward-looking statements. Forward-looking statements are statements of future expectations that are based on management's current expectations and assumptions and involve known and unknown risks and uncertainties that could cause actual results, performance or events to differ materially from those expressed or implied in these statements. Forward-looking statements include, among other things, statements concerning the potential exposure of Royal Dutch Shell to market risks and statements expressing management's expectations, beliefs, estimates, forecasts, projections and assumptions. These forward-looking statements are identified by their use of terms and phrases such as "anticipate", "believe", "could", "estimate", "expect", "goals", "intend", "may", "objectives", "outlook", "plan", "probably", "project", "risks", "schedule", "seek", "should", "target", "will" and similar terms and phrases. There are a number of factors that could affect the future operations of Royal Dutch Shell and could cause those results to differ materially from those expressed in the forward-looking statements included in this document, including (without limitation): (a) price fluctuations in crude oil and natural gas; (b) changes in demand for Shell's products; (c) currency fluctuations; (d) drilling and production results; (e) reserves estimates; (f) loss of market share and industry competition; (g) environmental and physical risks; (h) risks associated with the identification of suitable potential acquisition properties and targets, and successful negotiation and completion of such transactions; (i) the risk of doing business in developing countries and countries subject to international sanctions; (j) legislative, fiscal and regulatory developments including regulatory measures addressing climate change; (k) economic and financial market conditions in various countries and regions; (l) political risks, including the risks of expropriation and renegotiation of the terms of contracts with governmental entities, delays or advancements in the approval of projects and delays in the reimbursement for shared costs; and (m) changes in trading conditions. All forward-looking statements contained in this document are expressly qualified in their entirety by the cautionary statements contained or referred to in this section. Readers should not place undue reliance on forward-looking statements. Additional risk factors that may affect future results are contained in Royal Dutch Shell's Form 20-F for the year ended December 31, 2012 (available at www.shell.com/investor and www.sec.gov). These risk factors also expressly qualify all forward-looking statements contained in this document and should be considered by the reader. Each forward-looking statement speaks only as of the date of this document, October 31, 2013. Neither Royal Dutch Shell plc nor any of its subsidiaries undertake any obligation to publicly update or revise any forward-looking statement as a result of new information, future events or other information. In light of these risks, results could differ materially from those stated, implied or inferred from the forward-looking statements contained in this document.

We may have used certain terms, such as resources, in this document that the United States Securities and Exchange Commission (SEC) strictly prohibits us from including in our filings with the SEC. U.S. investors are urged to consider closely the disclosure in our Form 20-F, File No 1-32575, available on the SEC website www.sec.gov. You can also obtain this form from the SEC by calling 1-800-SEC-0330.

October 31, 2013

The information in this Report reflects the unaudited consolidated financial position and results of Royal Dutch Shell plc. Company No. 4366849, Registered Office: Shell Centre, London, SE1 7NA, England, UK.

Contacts:
- Investor Relations: International +31 (0) 70 377 4540; North America +1 713 241 1042
- Media: International +44 (0) 207 934 5550; USA +1 713 241 4544

Senator CARDIN. Thank you, Madam Chair.

Mr. Faber, I particularly thank you for your comments because I appreciate your testimony, I very much appreciate the group you represent, the Environmental Working Group. We are in agreement on our goals, and that is we understand the importance of energy security but we also want to make sure it is done in a way that is in the best interest of our environment. And I fully concur in that.

And if we were drafting a Renewable Fuels Standard bill today, I think we would be very cautious about using corn ethanol. And yes, you can say something positive. It is produced domestically. But the damage it causes and the disruption to the food supply, its efficiency issues, are certainly not the desirable outcome and we would want better results.

So, my question to you is, how do we level the playing field for second generation biofuels in the Renewable Fuel Standard provisions so that we can go to the type of product that is not only domestically produced but is better for the environment and our food supply?

Mr. FABER. Thank you, Senator Cardin. As you well know, the rise, the sudden rise in corn prices had a devastating impact on the broiler industry. Just between 2008 and 2011, about one-third of broiler companies were either in bankruptcy or closed or for sale. So, it was a difficult time to make, for that industry to make the adjustment to the higher corn prices. I think is important to remember that while it certainly helped one part of agriculture, it had a really significant impact on a second point of agriculture.

And to your point, I think if we had known that there would be this surge in prices in 2007, as a result of the mandate, we might have written a different kind of policy. Going forward, we think it is important to find ways to reduce the amount of corn ethanol that is blended into gasoline.

As we have heard, there is a limited pool for ethanol of any kind. Right now, that pool is saturated by corn ethanol. To make room for second generation biofuels, especially cellulosic ethanol, we believe it is important for Congress to help reduce the amount of corn ethanol that we are required to blend into gasoline. We think that would send a powerful signal to the investment community to place their bets on second generation fuel.

Senator CARDIN. So, just reducing the corn ethanol numbers would put additional incentives for investment into the next generation?

Mr. FABER. I think we have to face a simple fact which is that the way that we are managing RFS, the delays in the RVO, the likelihood of litigation has created an enormous amount of uncertainty, and it is time for Congress to step in and provide some new direction so that the investment community knows what sorts of investments to make.

Senator CARDIN. And let me bring up the second issue that you and are I in total agreement. The argument being made against trying to move forward a sensible reform of the Renewable Fuel Standards is that it opens up an area that could be mischief. And we have heard this argument many times before.

My view is that good policy is what we need to do and that the failure to enact good policy builds a pressure for more extreme results that could be damaging to our overall objective on the Renewable Fuel Standards. Would you want to comment on that?

Mr. FABER. I share your concerns. Certainly amending the Clean Air Act is fraught with peril. There are other proposals to weaken the Clean Air Act that might be offered as part of that process. I think it is important to keep that in mind as we reevaluate——

Senator CARDIN. And I assume that if we do any of those issues, you will be one of the strongest voices to point that out?

Mr. FABER. Absolutely.

Senator CARDIN. And I will be also.

Mr. FABER. I think there is a coalition that includes environmentalists, the people who produce food, the people who manufacture cars and other small engines who would work together to try to fend off any of those proposals, in part because we ultimately all want to see a more certain regulatory environment that really spurs the growth of these second generation fuels.

Senator CARDIN. Thank you.

Senator BOXER. Yes, and there is a similar coalition that would oppose us even opening up the Clean Air Act. I can assure you of that.

Mr. Coleman, you wanted desperately to say something. And then we will turn to Senator Fischer.

Mr. COLEMAN. Yes. Thank you. I sort of accused the RFS debate of flowing down the line of misinformation and I am hearing more of it, so I just want to respond.

Point No. 1, the monopoly question that Senator Inhofe raised. It does not matter whether it is a monopoly or not. It is not a price-driven, competitive marketplace. It is controlled at the top by OPEC, in the United States it is controlled at the wholesale level in huge swaths of this country by ExxonMobil. And so let us not get into a debate about whether it is a monopoly or not.

The issue is that it drives innovators out of a space. So, our guys have to look for and say, all right, if I innovate and if I create a better mouse trap and I beat those guys on price, I am going to sell my mouse trap. The problem with OPEC is that they can meet on a Tuesday, change prices on a Thursday, and that increases risk through the roof for guys that are trying to predict what is going to happen in 2017, 2018.

So, to Senator Inhofe's point, it does not matter whether it is a monopoly. What is happening is collusion in driving innovation out of the space, and the RFS fixes that by giving us a reasonable expectation of demand over time——

Senator BOXER. OK. I have to cut you off. You made a good point.

And I want to say, Senator, do you mind if Senator Vitter goes first with his remaining 3 minutes? Thank you.

Senator VITTER. Thank you. General Clark, did I hear your statement right that it is clear, and manufacturers agree, that E15 is fine, safe and no problem for 2001 and later?

General CLARK. I said that the Department of Energy tested a number of cars, I think 80-some-odd cars, 150,000 miles, 2001 and later models, with no problems from E15. What I said was manu-

facturers on current models, 2011, starting 2012 and 2013, those manufacturers are warranting for E15.

Senator VITTER. OK, that is an important clarification.

Let me just submit for the record some questions and answers summarized in a Jim Sensenbrenner letter which makes it crystal clear that manufacturers are extremely concerned about E15 for those older models going back to 2001 because that is a big concern by the people who make those engines. I would submit that for the record.

Senator BOXER. Thank you.

Senator VITTER. Let me also comment in reaction to some of the discussion about Clean Air Act issues, et cetera. Just as one hopefully important example, Senator Cardin and I are working on a focus bill in this area. The goal of that bill is to make this program far more workable and take out the threat of hitting the blend wall and causing real disruption, particularly for consumers.

The goal is not to revisit the Clean Air Act, to do away with the program, et cetera. Many of those things I would support. But in the context of working on this bill, that is not only not the goal, but I will oppose amendments that do that. And so it is just going to be about that sort of important reform to this program which I think is necessary.

Having said that, if the choice is between EPA using its waiver authority, and presumably it will have that every year, or doing a reform legislative effort like that which is not about the Clean Air Act, which is not about doing away with the whole program, I would like to hear from each of you what path you think we should go down. Basically, the legal status quo, let EPA handle it, or a focused legislative fix?

Senator BOXER. Senator. Would each of you commit to putting that important question in writing and getting it to this Committee in the next couple of weeks?

Senator VITTER. OK. And then in closing, Mr. Drevna, is EPA on time for the biodiesel standards?

Mr. DREVNA. Absolutely not.

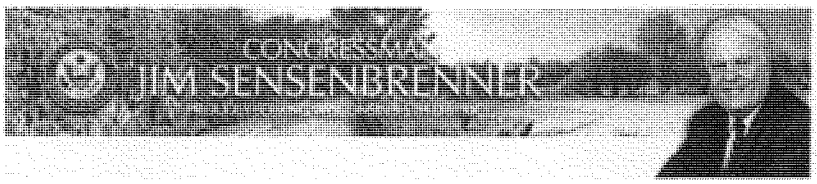
Senator VITTER. And does that impact EPA's ability to increase the mandate again?

Mr. DREVNA. Absolutely. If you look at section 211(o) of the Clean Air Act, when the RFS was enacted, the four buckets, so to speak, the different fuels, when it, Congress, set the volumes.

Senator VITTER. A final related question. Does any type of ethanol impact that blend wall issue?

Mr. DREVNA. As I mentioned earlier, Senator, once that molecule of ethanol is in an engine or an automobile or vehicle, it cannot differentiate whether it comes from corn, sugar cane from Brazil, or cellulosic that may or may not exist.

[The referenced information follows:]



ISSUES & LEGISLATION

Issue Statements

Sponsored Legislation

Co-Sponsored Legislation

My Voting Record

QUICK LINKS

> Email Jim
> Flag Requests
> Visit Washington, D.C.
> Watch Jim on YouTube
> Passport Assistance
> Help with a Federal Agency
> Academy Nomination
> Kids Page
> Sign up for News from Jim

E15

What is E15?

E15 is gasoline with 15 percent ethanol content.

What is is harmful?

E15 burns hotter than other fuel, and can harm engines.

In July, I contacted 14 automakers to inquire what would happen if E15 was used in their products. Automaker responses (view here)overwhelmingly show that E15 will damage engines, void warranties, and reduce fuel efficiency. Americans need a fuel that will give them more miles out of a gallon of gas and extend the lives of their cars—not one that will prematurely send their vehicles to the junkyard. For example:

- **Chrysler**: "We are not confident that our vehicles will not be damaged from the use of E15. . . . The warranty information provided to our customers specifically notes that use of the blends beyond E10 will void the warranty."
- **Toyota**: "Toyota cannot recommend the use of fuel with greater than E10 for Toyota vehicles currently on the road . . . .Our policy remains that we will not provide warranty coverage for issues arising from the misuse of fuels that exceed specified limits."

Can it be used on non-vehicle engines?
If E15 is made available in the marketplace, there is a serious concern for misfueling. E15 is not approved for off-road engines. In fact, it is downright dangerous in small gasoline-based engines like those in our lawnmowers, boats, and ATVs. E15 in a boat engine is like metal in a microwave. The United States Coast Guard warned that E15 in marine engines increases the risk of fires and explosions.

Timeline:

2/6/2012: Thirty-one organizations expressed their support for Congressman Jim Sensenbrenner's legislation, H.R. 3199, which requires the EPA to contract with the

National Academy of Sciences to study the effects of E15 on vehicles and engines. Tomorrow the House Science Committee will mark up H.R. 3199.

2/7/2012: House Science Committee Passes Sensenbrenner Bill to Test E15

- Sensenbrenner Statement on Study Finding E15 Harms Engines
  Posted in Press Releases and Statements on May 16, 2012
- Sensenbrenner Comment on Study Finding E15 Damages Engines
  Posted in Press Releases and Statements on April 4, 2012

All Related News...

F. JAMES SENSENBRENNER, Jr.
Fifth District, Wisconsin
COMMITTEE ON THE JUDICIARY
SUBCOMMITTEE ON CRIME, TERRORISM, AND HOMELAND SECURITY
CHAIRMAN
COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY
VICE-CHAIRMAN

Congress of the United States
House of Representatives
Washington, DC 20515–4905

WASHINGTON OFFICE:
Room 2449
Rayburn House Office Building
Washington, DC 20515-4905
202-225-5101
DISTRICT OFFICE:
120 Bishops Way, Room 154
Brookfield, WI 53005-6294
262-784-1111
OUTSIDE MILWAUKEE METRO CALLING AREA:
1-800-242-1119
WEBSITE:
http://sensenbrenner.house.gov

July 5, 2011

The Honorable Lisa Jackson
Administrator
The Environmental Protection Agency
1200 Pennsylvania Avenue, NW
Washington, DC 20004

Dear Administrator Jackson,

The Environmental Protection Agency (EPA) is increasingly out of touch with American consumers. Rebuilding our economy doesn't require that we sacrifice our environmental ideals, but the costs of agency actions must be balanced against the environmental benefits. Increasingly, the EPA seems focused on regulatory action with crippling costs and, at best, minimal environmental benefits.

The EPA recently issued a waiver to allow gasoline blends of up to 15% ethanol (E15) in cars and trucks of model year 2001 and later. This decision was apparently based on narrow Department of Energy testing that did not consider the effect that E15 would actually have on car engines.

On June 1, 2011, I wrote to 14 auto manufacturers and asked 3 questions: (1) Will E15 damage engines of model year 2001 and later? (2) Will your warranties cover damage from E15? and (3) Will E15 negatively affect fuel efficiency?

Engine manufacturers have been nearly unanimous in their beliefs that E15 will damage engines, void warranties, and reduce fuel efficiency. In difficult economic times, consumers need to get more miles from a gallon of gas and extend the lives of their cars. EPA's waiver threatens the already precarious financial situation of American families with no discernible environmental benefit.

I have attached all the responses, but want to highlight quotes from each manufacturer:

> Chrysler: "We are not confident that our vehicles will not be damaged from the use of E15 . . . The warranty information provided to our customers specifically notes that use of the blends beyond E10 will void the warranty."
>
> Ford: "Ford does not support the introduction of E15 into the marketplace for the legacy fleet . . . Fuel not approved in the owner's manual is considered misfueling and any damage resulting from misfueling is not covered by the warranty."
>
> Mercedes-Benz: "Any ethanol blend above E10, including E15, will harm emission control systems in Mercedes-Benz engines, leading to significant problems."

Honda: "Vehicle engines were not designed or built to accommodate the higher concentrations of ethanol . . . There appears to be the potential for engine failure."

Mazda: "The record fails to demonstrate that motor vehicles would not be damaged and result in failures when run on E15."

Toyota: "Toyota cannot recommend the use of fuel with greater than E10 for Toyota vehicles currently on the road . . . Our policy remains that we will not provide warranty coverage for issues arising from the misuse of fuels that exceed specified limits."

Nissan: "We are not at all confident that there will not be damage to MY 2001 and later vehicles that are fueled with E15. In our view the record fails to demonstrate that motor vehicles . . . would not be damaged and result in failures when run on E15."

Volkswagen: "Volkswagen agrees that the EPA did not conduct an adequate test program when E15 was considered and then approved for use in conventional vehicles. . . Our current warranty will not cover problems stemming from the use of E15."

Volvo: "The risks related to emissions are greater than the benefits in terms of CO_2 when using low-blend E15 for variants that are designed to E10."

BMW: "BMW Group engines and fuel supply systems can be damaged by misfueling with E15 . . . Damage appears in the form of very rapid corrosion of fuel pump parts, rapid formation of sludge in the oil pan, plugged filters, and other damage that is very costly to the vehicle owner."

Hyundai: "The EPA tests failed to conclusively show that the vehicles will not be subject to damage or increased wear."

Kia: "EPA testing failed to determine that vehicles will not be subject to damage or increased wear."

And the problems do not stop there. On June 22, 2011, I sent a second letter to small engine manufacturers. While the EPA's waiver does not apply to small engines, many small engines are fueled remotely—gasoline is initially filled into a container which is then used to fuel the engine. This creates a substantial risk of misfueling despite the EPA's labeling efforts. In my June 22 letter, I asked small engine manufacturers if they were confident that the EPA had done enough to avoid misfueling and whether they thought E15 would damage their engines. In the limited responses I have received, small engine manufacturers have expressed significant concerns. These responses are also attached.

E15 is a product that simply does not belong in the marketplace. I am writing to urge the EPA to heed these warnings and reconsider its E15 waiver. In furtherance of my work on the House Science, Space and Technology Committee and on behalf of my constituents, please respond to the following questions by July 21, 2011:

1. Did the EPA consider the effects E15 would have on engine durability and fuel efficiency before granting its waiver?
2. Is the EPA confident that E15 will not damage car engines in model years 2001 and later?

3. What effect does the EPA believe that E15 will have on fuel economy?
4. Does the EPA believe that its recent labeling safeguards for E15 will be sufficient to prevent misfueling in car and truck engines older than model year 2011 and in small engines?

I greatly appreciate your prompt response and attention to this matter.

Sincerely,

F. James Sensenbrenner, Jr.
Vice-Chairman, House Committee on Science, Space, and Technology

cc: The Honorable Ralph Hall
Chairman, Committee on Science, Space, and Technology

The Honorable Eddie Bernice Johnson
Ranking Member, Committee on Science, Space, and Technology

KIA MOTORS

Kia Motors Corporation Washington Office
1660 L Street, NW, Suite 201
Washington, DC 20036
Tel: 202-503-1515 Fax: 202-503-1516

July 1, 2011

The Honorable F. James Sensenbrenner, Jr.
Vice-Chairman, House Committee on Science, Space and Technology
United States House of Representatives
Room 2499
Rayburn House Office Building
Washington, DC 20515-5101

Dear Vice-Chairman Sensenbrenner,

Thank you for your June 1, 2011 letter to Kia Group President and Chief Executive Officer Byung Mo Ahn inquiring on Kia's views of ethanol blends and the Environmental Protection Agency (EPA) efforts to change the levels of use by 50 percent or to an E15 level. We are honored to be asked to comment on your work for the House Committee on Science, Space and Technology and are pleased to respond to your specific questions on E15.

Overall, Kia believes more testing is required before introducing a new fuel into the marketplace. Scientific review can determine the positive and negative impact a new fuel can have on air quality, consumer acceptance and engine durability.

We have addressed your questions outlined in the June 1 letter:

Question One on confidence that our cars and trucks from model year 2001 and later will not be damaged by or wear out more quickly from the use of E15; **EPA testing failed to determine that vehicles will not be subject to damage or increased wear. Therefore Kia has no basis to conclude that vehicles will not be damaged by or wear out faster due to the use of E15.**

Question Two concerning current warranties and potential problems stemming from the use of E15 in cars and trucks from model year 2001 and later; **On pages 9-10 of the Warranty Manual, Kia states: " Improper maintenance or the use of other than the specified fuel, oil or lubricants recommended in your Owner's Manual. It is your obligation to ensure that you obtain all fuels, oils and lubricants from reliable vendors using quality products which meet the Kia specifications identified in your Owner's Manual. In the event that problems result to your vehicle due to service from vendors who use reduced quality products, your vehicle warranties will not provide coverage."**

KIA MOTORS

Kia Motors Corporation Washington Office
1660 L Street, NW, Suite 201
Washington, DC 20036
Tel: 202-503-1515 Fax: 202-503-1516

Kia's Owner's Manual in section 1, page 3 provides that owner's shouldn't use anything greater than 10% ethanol and that a 15% mixture will damage the vehicle. (Kia Warranty and Owner's Manuals are attached for your review)

Question Three on the effect of E15 on the fuel efficiency of our engines; Kia believes that E15 will lead to degradation in fuel efficiency due to the lower energy content than gasoline.

Thank you for your letter and the opportunity to share our views on E15. If you have further comments or questions, I can be reached on 202 503-1515 or jta@kia-dc.com.

Sincerely,

J. T. Anderson

John T. Anderson
Director, Kia Government Affairs

cc: The Honorable Ralph Hall
Chairman, Chairman Committee on Science, Space and Technology

The Honorable Eddie Bernice Johnson
Ranking Member, Committee on Science, Space and Technology

Mr. Byung Mo Ahn
Group President and Chief Executive Officer
Kia Motors America

HONDA

Honda North American, Inc.
1001 G Street, N.W. Suite 950
Washington, D.C. 20001
Phone (202) 661-1400

June 13, 2011

Hon. F. James Sensenbrenner, Jr.
Vice Chairman
Committee on Science, Space, and Technology
House of Representatives
Washington, D.C. 20515-4905

Dear Mr. Vice Chairman:

Mr. Tetsuo Iwamura, President and Chief Executive Office of American Honda Motor Company, Inc., has asked that I respond to your June 1, 2011, letter regarding the Environmental Protection Agency's recent approval of a blend of 15 percent ethanol (E15) for use in cars and trucks of Model year 2001 or later. You have raised the following three questions:

1. **Are you confident that your cars and trucks from model year 2001 and later will not be damaged by or wear more quickly from use of E15?**

As you know, the Clean Air Act requires motor vehicle manufacturers to certify that the vehicles they sell will meet or exceed emissions standards in effect at the time each vehicle is introduced into commerce. There are specific testing protocols that must be employed for certification, including specifications for fuels used in the vehicles during testing. As a result, we engineer our vehicles to meet or exceed the standards utilizing the prescribed test fuel, which never has contained ethanol. However, given the fuels prevalent in the market over the last decade, the engines in Model Year 2001 later vehicles were built to operate on fuels with ethanol concentrations of up to 10% (E10).

Authorizing the sale of E15 in 2010 for vehicles built after 2001 presents an obvious problem for auto manufacturers -- vehicle engines were not designed or built to accommodate the higher concentrations of ethanol. The differences between E10 and E15, including E15's higher oxygen content, lower energy content and heightened corrosivity, require use of more robust component materials and different engine calibrations. The engines in our Model Year 2001 and later vehicles do not have those necessary materials or calibrations.

In our owner's manuals, Honda requires its customers to refuel their vehicles with E10 or below. The impact of E15 on our engines is not completely known at this stage, although there appears to be the potential for engine failure. During the EPA's consideration of the partial waiver approving the use of E15, Honda and its trade association, the Association of International Automobile Manufacturers (AIAM) (now known as Global Automakers), urged the agency to defer its decision until such time as the testing program on the impact of E15 on vehicles is complete. The testing is being managed by the Coordinating Research Council (CRC), an independent organization funded by the automobile and oil industries, with limited contributions from the U.S. government. Honda is a member of the CRC and active in its testing.

It is unfortunate that EPA did not wait for the results of the seven major test programs that are being undertaken by CRC. These programs include critical tests for engine durability and fuel system material compatibility. Potential E15-related failures have already been identified in some of these programs, including the possible confounding of a vehicle's on-board diagnostic system. This can lead to illumination of the "check engine" light when in fact there is no malfunction, or the failure of the light to illuminate when there is a problem.

Because E15 has not been in the market and our engines were not designed for its use, we do not have a detailed understanding of the implications of the widespread use of the fuel in our vehicles. However, these early results from the CRC testing cause us concern. The CRC studies are due to be completed beginning in late-2011.

2. **Will your current warranty cover potential problems stemming from the use of E15 in cars and trucks from model year 2001 and later?**

As noted above, Honda products were designed, built and certified to operate on E10 and below. Use of higher blends could compromise the vehicle's warranty.

3. **Will E15 affect the fuel efficiency of your engines?**

Ethanol contains less energy than gasoline on a gallon-for-gallon basis. Accordingly, customers can expect to experience about 5% - 6% inferior fuel economy using E15 rather than E0 (the difference between E10 and E15 will be smaller). Customers using E85 (in a vehicle designed to use E85) instead of E10 will experience about a 27% decrease in fuel economy. For example, a vehicle that gets 300 miles to the tank on today's gasoline will likely achieve only about 219 miles to the tank with E-85.

If you have further questions regarding E15, please feel free to contact me at (202) 661-4400.

Sincerely,

Edward B. Cohen
Vice President
Government & Industry Relations

cc: The Honorable Ralph Hall, Chairman
Committee on Science, Space, and Technology

The Honorable Eddie Bernice Johnson, Ranking Member
Committee on Science, Space, and Technology

CHRYSLER

Jody Trapasso
Senior Vice President
External Affairs

June 23, 2011

The Honorable F. James Sensenbrenner, Jr.
Vice-Chairman
House Committee on Science, Space and Technology
U.S. House of Representatives
2449 Rayburn House Office Building
Washington, DC 20515-4905

Dear Vice-Chairman Sensenbrenner:

Sergio Marchionne asked me to respond to your June 1, 2011 letter requesting information about the Environmental Protection Agency's (EPA or Agency) decisions to allow the use of 15 percent ethanol (E15) in passenger cars and light trucks beginning with the 2001 Model Year (MY).

Beginning in the late 1970's, Chrysler was one of the first automakers to endorse and support the use of "gasohol" (i.e., gasoline with up to 10 percent ethanol, or E10). Since then, all of our conventional gasoline-fueled cars and trucks have been designed and warranted for E10 operation. Chrysler has also produced Flexible-Fuel Vehicles (FFVs) since the 1998 MY and voluntarily committed that 50 percent of our fleet produced by 2012 will be capable of operating on renewable fuels. These vehicles are designed, warranted and developed to operate on gasoline, E85 ethanol or any blend in between.

While Chrysler has been a strong advocate of renewable fuels, we have concerns about the potential harmful effects of E15 in engines and fuel systems that were not designed for use of that fuel. In cooperation with other automakers, we have been conducting tests of vehicles in the 2001 and later model year vintage to assess the effect of E15 on their engines and fuel systems. Prior to EPA's decisions to allow E15, we had requested that the Agency defer from making any decisions regarding higher ethanol blends for conventional vehicles until existing testing programs have been completed and the data fully evaluated.

Chrysler Group LLC | CIMS 936-00-00 | 1401 H Street, NW, Suite 700 | Washington, DC USA | 20005
Phone 202.414.6756 | Fax 202.414.6729 | jody.trapasso@chrysler.com

Provided below are answers to the three specific questions asked in your letter.

1. Are you confident that your cars and trucks from model year 2001 and later will not be damaged by or wear more quickly from use of E15?

No, we are not confident that our vehicles will not be damaged from the use of E15. While future products could be designed to accommodate E15 or other mid-level blends of ethanol, testing to date suggests that both newer and older models (non-FFVs) may experience more engine wear and fuel system damage from the use of E15.

2. Will your current warranty cover potential problems stemming from the use of E15 in cars and trucks from model year 2001 and later?

No. Chrysler's conventional vehicles (non-FFVs) are only warranted for use of E10. The warranty information provided to our customers specifically notes that use of blends beyond E10 will void the warranty.

3. Will E15 affect the fuel efficiency of your engines?

Yes. The energy content (Btu/gallon) of fuel decreases as the ethanol concentration increases. As a result, we expect the fuel efficiency of our conventional products (non-FFVs) to decrease with any increase in ethanol content.

I hope that this information responds to your request. Please do not hesitate to contact me if you need any additional information.

Sincerely,

Jody Trapasso

Susan M. Cischke
Group Vice President-Sustainability,
Environment & Safety Engineering

World Headquarters
One American Road
Dearborn, MI 48126-2798 U.S.A

June 8, 2011

The Honorable James Sensenbrenner, Jr.
Vice-Chairman, House Committee on
Science, Space, and Technology
Rayburn House Office Building, Room 2449
Washington, D.C. 20515

Dear Vice-Chairman Sensenbrenner:

Alan Mulally has asked me to respond to your letter of June 1 regarding the introduction of E15 fuel into the marketplace.

At Ford, we recognize the need to increase the use of biofuels to meet the country's goals of energy security and reduced greenhouse gas emissions. Ford has produced, and continues to offer, a substantial number of flexible fuel vehicles (FFV) capable of operating on E85 (85% ethanol) across many models. The renewable fuel standard, passed into law in 2007, requires 36 billion gallons of biofuels to be blended into transportation fuel by 2022. In order to meet that goal, the country needs to increase the use of ethanol beyond the 10% (E10) used today, but needs to do so in a fashion that does not have a negative impact on the legacy fleet.

This can be accomplished by taking a prospective approach to the introduction of mid-level blends whereby manufacturers, provided with enough lead time, can design new vehicles with the capability of accommodating the new fuel. Likewise, the lead time will give fuel providers an opportunity to prepare to make the new fuel available nationwide. In contrast, an approach in which fuel specifications are changed abruptly, and the new fuel is allowed to be used on vehicles that were not designed for it, is likely to lead to undesirable outcomes for consumers, the new fuel, and the legacy vehicles.

Below are answers to your specific questions:

Q1 Are you confident that your cars and trucks from model year 2001 and later will not be damaged by or wear more quickly from use of E15?

Ford does not support the introduction of E15 into the marketplace for the legacy fleet. The entire legacy fleet of non-FFVs, including vehicles built in model year 2001 and later, consists of vehicles that were designed to operate in a range of fuels from pure gasoline up to a blend of 10 percent ethanol (E10) -- not E15. We remain concerned that legacy fleet, operating on a fuel the vehicles were not designed for, will not meet customer expectations for quality, durability, performance and fuel economy, as well as legal requirements to meet emission standards and

on-board diagnostic regulations. Efforts to increase renewable fuel use must be carried out in a way that does not create undue risks and problems for existing vehicles on the road.

Q2 Will your current warranty cover potential problems stemming from the use of E15 in cars and trucks from model year 2001 and later?

The owners' manuals for these legacy vehicles do not identify E15 as a fuel that may be used in the vehicles. They go on to say that the use of a fuel not approved in the owners' manual is considered misfueling, and that any damage resulting from misfueling is not covered by the warranty. To the extent that E15 is introduced into commerce, we will work with our customers and dealerships as best we can to address any potential concerns, but we cannot redesign vehicles that have already been built and sold.

Q3 Will E15 affect the fuel efficiency of your engines?

Going from the generally available E10 fuel to E15 will not have a significant impact on the efficiency of the engine, but because ethanol contains less energy per a given volume of fuel, customers will experience slightly lower miles per gallon when driving on E15 versus E10.

Ford appreciates the opportunity to provide our views on this subject. Thanks again for your continued support of the automotive industry.

Sincerely,

Susan M. Cischke
Group Vice President
Sustainability, Environment & Safety Engineering
Ford Motor Company

cc: The Honorable Ralph Hall
Chairman, Committee on Science, Space, and Technology

The Honorable Eddie Bernice Johnson
Ranking Member, Committee on Science, Space, and Technology

Mazda North American Operations

James J. O'Sullivan
President and CEO

June 7, 2011

The Honorable F. James Sensenbrenner
Vice-Chairman
House Committee on Science, Space and Technology
United States House of Representatives
2449 Rayburn House Office Building
Washington, D.C. 20515-4905

Dear Vice-Chairman Sensenbrenner:

We appreciate receiving your June 1, 2011 letter regarding EPA's two partial waiver decisions that permit the sale of gasoline containing up to 15 percent ethanol (E15) for 2001 model year (MY) and newer passenger cars and light trucks. We believe that increasing the allowable ethanol content in gasoline by 50 percent will have unintended consequences for auto manufacturers, consumers, fuel suppliers and distributors. Mazda's primary concern about an E15 waiver is the overriding need for consumer satisfaction.

Specifically, your letter asks for responses to the following three questions. Our responses are provided below.

1. **Are you confident that your cars and trucks from model year 2001 and later will not be damaged by or wear more quickly from use of E15?**

   No, we are not at all confident that there will not be damage to MY 2001 and later vehicles that are fueled with E15. In our view, the record fails to demonstrate that motor vehicles (other than FFVs) would not be damaged and result in failures when run on E15. No Mazda vehicles were included in the models tested by the government.

2. **Will your current warranty cover potential problems stemming from the use of E15 in cars and trucks from model year 2001 and later?**

   Mazda vehicles covered by the waiver were designed to use a maximum of E10. The direction in the owner guides of Mazda vehicles reflects the fact that they were not designed to run on E15. EPA regulations allow manufacturers to deny warranty coverage for vehicles damaged due to mis-fueling (based on the owner's manual instructions). We are encouraging Mazda vehicle owners to continue to consult their owners' manuals for information regarding the appropriate fuel for their vehicles.

7755 Irvine Center Drive Irvine, CA 92618-2922 Telephone 949 727 1990
PO Box 19734 Irvine, CA 92623-9734 Facsimile 949 727 6529 Internet http://www.mazdausa.com

Mazda owner's manuals specify the following:

> *"Your vehicle can use only oxygenates that contain no more than 10 percent ethanol by volume. Harm to your vehicle may occur when ethanol exceeds this recommendation, or if the gasoline contains any methanol."*
>
> *"Vehicle damage and drivability problems resulting from the use of the following may not be covered by the Mazda warranty.*
> - *Gasohol containing more than 10% ethanol.*
> - *Gasoline or gasohol containing methanol.*
> - *Leaded fuel or leaded gasohol."*

3. **Will E15 affect the fuel efficiency of your engines?**

   Yes. A gallon of ethanol has lower energy content than a gallon of gasoline. Therefore, any increase in ethanol content will necessarily degrade fuel economy.

Thank you for considering our views. If you have any questions about this information, please contact Barbara Nocera at bnocera@mazdausa.com or 202.467.5096.

Sincerely,

James J. O'Sullivan

cc: The Honorable Ralph Hall
Chairman, Committee on Science, Space, and Technology

The Honorable Eddie Bernice Johnson
Ranking Member, Committee on Science, Space, and Technology

BMW Group

June 23, 2011

The Honorable F. James Sensenbrenner, Jr.
Vice-Chairman
House Committee on Science, Space, and Technology
United States House of Representatives
Washington, DC 20515-4905

Dear Mr. Vice-Chairman:

This is in response to your June 1, 2011 letter regarding the recent approvals by the EPA to permit a gasoline blend of 15 percent ethanol (E15) for use in model year 2001 and later passenger cars and light trucks. Our Chairman asked me to respond to your request.

On behalf of BMW of North America, LLC (BMW NA), please find below your questions followed by our answers.

1. *Are you confident that your cars and trucks from model year 2001 and later will not be damaged by or wear more quickly from use of E15?*

   BMW NA Response: No. BMW Group engines and fuel supply systems can be damaged by misfueling with E15. BMW has designed its engines and fuel systems to operate with gasoline up to E10 and our owners have already experienced damage when, for example, a gasoline terminal mixes greater than 10% ethanol into the tanker. As a result of periodic damage, BMW NA has issued Service Information Bulletins (attached) warning of potential damage, and our dealers have ethanol test kits to measure the percentage of ethanol in the vehicle's tank.

   Damage appears in the form of very rapid corrosion of fuel pump parts, rapid formation of sludge in the oil pan, plugged filters, and other damage that is very costly to the vehicle owner.

   As you would expect, engines and fuel systems already on the road cannot be retroactively designed to be compatible with ethanol blends higher than used for the original design.

2. *Will your current warranty cover potential problems stemming from the use of E15 in cars and trucks from model year 2001 and later?*

   BMW NA Response: No. Our warranty states that it does not cover malfunctions caused by use of fuels containing more than 10% ethanol. Our dealers have an alcohol detection tool to identify ethanol blends that exceed the allowable 10% maximum. We anticipate that the owners of vehicles damaged by higher levels of ethanol will be frustrated, notwithstanding the warnings contained in our warranty booklets.

Company
BMW of North America, LLC

BMW Group Company

Office address

200 Chestnut Ridge Road
Woodcliff Lake, NJ 07677

Telephone
(201) 571-5071

Fax
(201) 571-5470

E-mail
Tom.Belger@bmwna.com

3. Will E15 affect the fuel efficiency of your engines?

Response: Yes. Engine compression ratios, turbo-charging pressures, and control mapping are designed to optimize fuel economy, performance, and emissions based on a maximum of E10. Since ethanol has about 34% less energy than gasoline, an engine designed to run on up to E10 will suffer a corresponding loss in fuel economy. More importantly, use of ethanol blends higher than E10 in the wrong engines will result in drivability problems at high and low temperatures including hard starting, stalling, and hesitation.

Recommendations

BMW NA respectfully makes the following recommendations if increased percentages of ethanol in gasoline are required:

- Legacy E10 gasoline must be required by law for the next 15 years to accommodate vehicles, motorcycles, and other power equipment currently in use that would be damaged by E10+.
- Implementation of effective efforts to prevent misfueling, including requiring strong language on pump labels on E10+ pumps that warn of damage from misfueling and advise users to "Check your owner's manual for ethanol warnings," and consider the use of a different nozzle size for E10+ pumps to diminish the chance of inadvertent misfueling.
- An ethanol misfueling owner reimbursement clearinghouse, funded by the ethanol industry, should be established by law to allow owners to recoup repair costs from misfueling damage. Vehicle OEMs and gas station owners should be indemnified from damages caused by misfueling.
- By law, before a gas station storage tank is filled with ethanol blends greater than E0 or E10 for the first time, the tank must be cleaned and filters installed to prevent newly-dissolved dirt caused by water and alcohol from being pumped into consumers' tanks.
- In general, we favor the introduction of an increase to E20 in ethanol content together with a 5 year minimum lead time for engine and fuel system developers.

If you or your staff has further questions, please contact me at 201-571-5071.

Sincerely,

Thomas C. Baloga
Vice President,Engineering US

cc: The Honorable Ralph Hall
Chairman, Committee on Science, Space, and Technology

The Honorable Eddie Bernice Johnson
Ranking Member, Committee on Science, Space, and Technology

Enclosures

Service Information

Fuel Systems B13 05 10

This Service Information bulletin replaces SI B13 04 06 dated August 2006.

SUBJECT

Testing Fuel Composition

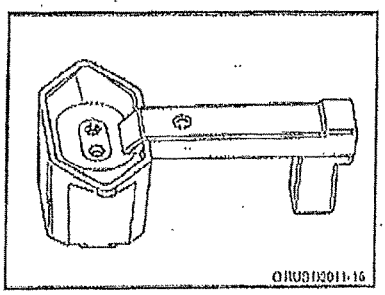
MODEL

All

SITUATION

Fuel blends containing a high percentage of alcohol (10% and above), mainly ethanol, are becoming more commercially available. Usage of E85 or any other high alcohol content blend (e.g., E30) in BMW vehicles will cause various drivability complaints (cold start problems, stalling, reduced performance, poor fuel economy, etc.); may cause excessive emissions; and may cause irreversible damage to engine, emission control and fuel delivery systems due to incompatibility of materials with alcohols. Refer to SI B13 01 06 Alcohol Fuel Blends in BMW Vehicles for complete details.

In order to correctly diagnose various drivability complaints caused by fuel blends with a high level of ethanol content, BMW is providing you with an electronic fuel composition tester.



Fuel Composition Tester
P/N 83 30 0 439 685

Refer to B04 04 11 for more details.

PROCEDURE

Safety Precautions:

- Gasoline is highly flammable; observe normal precautions for working with flammable liquids. Perform all tests away from any source of ignition. A class B fire extinguisher must be available.
- Wear protective eye protection with side shields and Nitrile rubber gloves for handling the tester.
- Please adhere to any applicable OSHA regulations when handling gasoline.
- Dispose of the mixture according to local, state and federal regulations.

Refer to the attached procedure for testing the fuel composition of gasoline.

WARRANTY INFORMATION

Component damage, malfunctions, or any drivability problems verified to be caused by the use of fuels containing more than 10% ethanol (or other oxygenates with more than 2.8% oxygen by weight) will not be covered under BMW warranties as this is not considered a defect in materials or workmanship. Always document the results found on the vehicle repair order whenever performing this test.

Service Information

Fuel Systems B13 01 06 Technical Service

This Service Information bulletin supersedes SI B13 01 06 dated September 2006.

Changes to this revision are identified by a black bar.

SUBJECT

Alcohol Fuel Blends in BMW Vehicles

MODEL

All with gasoline engines

SITUATION

Fuel blends containing a high percentage (above 10%) of alcohol, mainly ethanol, are becoming more commercially available. Customers inquire about the possibility of using alcohol fuels (e.g., E85) in BMW vehicles.

INFORMATION

Fuels containing up to and including 10% ethanol; or other oxygenates with up to 2.8% oxygen by weight, that is, 15% MTBE (methyl tertiary butyl ether); or 3% methanol plus an equivalent amount of cosolvent will not void the applicable warranties with respect to defects in materials or workmanship.

Usage of such alcohol fuel blends may result in drivability, starting, and stalling problems due to reduced volatility and lower energy content of the fuel. Those drivability problems may be especially evident under certain environmental conditions such as high or low ambient temperatures and high altitude.

Only specially adapted vehicles (FFV - Flexible Fuel Vehicles) can run on high alcohol fuel blends. BMW, for the various technical and environmental reasons explained below, does not offer FFV models.

Usage of E85 or any other high-alcohol content blend (e.g., E30) in BMW vehicles will cause various drivability complaints (cold-start problems, stalling, reduced performance, poor fuel economy, etc.); may cause excessive emissions; and may cause irreversible damage to engine, emission control and fuel delivery systems due to incompatibility of materials with alcohols.

General Notes Regarding E85 Fuel

E85 fuel contains 85% (by volume) ethanol and 15% gasoline. Ethanol can be produced chemically from ethylene or biologically from grains, agricultural wastes, or any organic material containing starch or sugar. In the US, ethanol is mainly produced from corn and is classified as a renewable fuel.

Similar to gasoline, ethanol contains hydrogen and carbon with additional oxygen molecules built into its chemical chain. This chemical structure makes ethanol's burning process slightly cleaner than gasoline (lower tailpipe emissions).

On the other hand, due to lower carbon content, ethanol provides 27% less energy (for identical volume) than gasoline, resulting in reduced fuel economy of E85 vehicles (approximately 22% higher consumption). Increased fuel consumption requires appropriately enlarged fuel tank capacities (usually a 30% increase), and specific DME calibrations for E85 lower stoichiometric air/fuel ratio (10 compared to 14.7 for gasoline engines).

E85 fuel volatility is typically lower than gasoline (RVP 6-10 psi, compared to 8-15 psi for gasoline). Lower fuel volatility will reduce vehicle evaporative emissions, but it may cause cold-starting problems, especially with lower ambient temperatures.

Under certain environmental conditions, mainly lower ambient temperatures, ethanol separates from the gasoline/alcohol mixture and absorbs water. The ethanol-absorbed water molecules are heavier than gasoline or ethanol; they remain at the bottom of fuel tank and, when introduced into the combustion process, they tend to form an extremely lean mixture resulting in misfire, rough idle and cold-starting problems.

Certain materials commonly used with gasoline are totally incompatible with alcohols. When these materials come in contact with ethanol, they may dissolve in the fuel, which may damage engine components and may result in poor vehicle drivability.

Some metals (e.g., zinc, brass, lead, aluminum) become degraded by long exposure to ethanol fuel blends. Also, some nonmetallic materials used in the automotive industry such as natural rubber, polyurethane, cork gasket material, leather, polyvinyl chloride (PVC), polyamides, methyl-methacrylate plastics, and certain thermo and thermoset plastics degrade when in contact with fuel ethanol.

In order to safely and effectively operate a motor vehicle running on E85, the vehicle must be compatible with alcohol use. Some manufacturers have developed vehicles called FFV (Flexible Fuel Vehicle) that can operate on any blend of ethanol and gasoline (from 0% ethanol and 100% gasoline to 85% ethanol and 15% gasoline). Ethanol FFVs are similar to gasoline vehicles, with main differences in materials used in fuel management and delivery systems, and DME control module calibrations. In some cases, E85 vehicles also require special lubricating oils.

Aftermarket conversions of gasoline-powered vehicles to ethanol-fueled vehicles, although possible, are not recommended, due to internal materials and DME software incompatibility as well as the high costs of conversion.

In order to correctly diagnose various drivability complaints caused by fuel blends with a high level of ethanol content, refer to SI B13 05 10, Testing Fuel Composition for applicable tools and procedures.

WARRANTY INFORMATION

Components damage/malfunctions or any drivability problems caused by the use of fuels containing more than 10% ethanol (or other oxygenates with more than 2.8% oxygen by weight) will not be covered under BMW warranties with respect to defects in materials or workmanship.

Mercedes-Benz

Mercedes-Benz USA, LLC
Ernst H. Lieb
President and CEO

June 10, 2011

The Honorable F. James Sensenbrenner, Jr.
2449 Rayburn House Office Building
Washington, DC 20515-4906

Dear Congressman Sensenbrenner:

Thank you for your letter regarding the Environmental Protection Agency's (EPA) decision to approve E15 for use in cars and trucks of Model Year 2001 or later. I appreciate the opportunity to respond to your inquiry.

Biofuels play an important part in strengthening our nation's energy security. But, like you, I am concerned over the EPA's decision to grant a waiver for E15 use in certain model year cars and trucks. A premature introduction of E15 into the marketplace will heighten consumer confusion and undercut studies already underway that aim to evaluate the effects of increased ethanol blends on vehicle parts and systems.

As you may know, numerous organizations across the United States have commented on the EPA's decision. Automakers are not alone in voicing their opposition. Among others, the auto industry is joined by organizations representing agriculture, small engine manufacturers, and small business owners in uniformly opposing this premature decision on ethanol.

Throughout its operations in the U.S., Mercedes-Benz has provided the most advanced engine and emission control systems to meet the requirements of the U.S. market. All current Mercedes-Benz fleet vehicles and series model lines up to MY 2011 are designed and tested for the use of E10. We have relied on this E10 blend wall in our vehicle design, and any ethanol blend above E10, including E15, will harm emissions control systems in Mercedes-Benz engines, leading to significant problems with certification, in-use testing, emissions performance and fuel economy.

Mercedes-Benz customers who misfuel with E15 will force the Company to face a host of product liability actions. Although the Mercedes-Benz warranty in the owner's manual is clearly restricted to claims involving "proper maintenance," it would be impossible for the Company to prove that the vehicle damage is due to customer misfueling.

Mercedes-Benz USA, LLC
One Mercedes Drive
P.O. Box 350
Montvale, NJ 07645-0350
Phone (201) 573-0600
Fax (201) 573-0117
www.MBUSA.com

Mercedes-Benz - are registered trademarks of Daimler AG, Stuttgart, Germany

The deterioration, early wear, and aging process depend on how much and how often customers misfuel. Thus, Mercedes-Benz and other manufacturers will be forced into legal actions at a serious disadvantage.

More information on the compatibility of higher ethanol blends in vehicles must be obtained—we simply need more research on the possible negative effects this could have on engines and vehicle components.

At Mercedes-Benz, consumer satisfaction is paramount. Anything that might jeopardize our customer's perception of quality, performance, and safety of a Mercedes vehicle is of deep concern. For this reason, we have steadfastly opposed the EPA's decision to increase ethanol blends without full, comprehensive study. I am pleased that auto manufacturers have been joined by dozens of other associations and industries in voicing similar objections.

Congressman, thank you for your leadership on this issue. Again, thank you for contacting me.

Sincerely,

TOYOTA

TOYOTA MOTOR NORTH AMERICA, INC.

WASHINGTON OFFICE
601 THIRTEENTH STREET, NW, SUITE 910 SOUTH, WASHINGTON, DC 20005

TEL: (202) 775-1700
FAX: (202) 822-0926

June 13, 2011

The Honorable F. James Sensenbrenner, Jr.
Vice Chairman
House Committee on Science, Space, and Technology
Room 2449 Rayburn House Office Building
Washington, DC 20515

Dear Vice Chairman Sensenbrenner:

I am writing in response to your June 1, 2011 letter to James Lentz concerning the Environmental Protection Agency's (EPA's) approval of E15 for use in 2001 model year and later vehicles.

Toyota strongly supports the development of alternative fuels to help reduce dependence on foreign oil and potentially reduce vehicle emissions. However, along with many other automobile manufacturers, Toyota is concerned about the EPA waivers approving use of E15 for 2001 model year and newer vehicles. As you may know, Toyota is a member of the Alliance of Automobile Manufacturers and the Association of Global Automakers, and these trade associations have joined with the National Marine Manufacturer's Association and the Outdoor Power Equipment Industries to challenge EPA's E15 waiver decisions.

Listed below are the questions from your letter along with Toyota's response:

1) Are you confident that your cars and trucks from model year 2001 and later will not be damaged by or wear more quickly from use of E15?

   RESPONSE: With the exception of the Flexible Fuel Vehicle (FFV) versions of our Tundra and Sequoia (which were designed specifically for the higher ethanol-based fuel), all Toyota, Lexus and Scion models on the road today have only been designed for fuels with up to 10% ethanol (E10). Moving from E10 to E15 represents a 50% increase in the alcohol content of the fuel compared to what the vehicles were designed to accept. Unfortunately, the data considered in connection with EPA's E15 waivers does not adequately determine the effect of this change on Toyota's legacy fleet. Accordingly, Toyota cannot recommend the use of fuel with greater than E10 (10% ethanol) for Toyota vehicles currently on the road, except for the FFV's.

2) Will your current warranty cover potential problems stemming from the use of E15 in cars and trucks from model year 2001 and later?

RESPONSE: The vehicle owner's manual for Toyota, Lexus and Scion vehicles clearly recommends against using fuels with ethanol content greater than 10%, except for the FFV's, which can use fuels up to 85% ethanol. Our policy remains that we will not provide warranty coverage for issues arising from the misuse of fuels that exceed specified limits.

3) Will E15 affect the fuel efficiency of your engines?

RESPONSE: Because a gallon of ethanol has lower energy content than a gallon of gasoline, higher level ethanol blends will generally result in lower real-world vehicle fuel economy.

Toyota recognizes that ethanol and other renewable fuels will continue to play an important role in US energy policy. But, rather than pursue a *retrospective* solution that carries substantial risks for consumers, automakers, equipment makers and fuel providers, we need a *prospective* solution that provides adequate lead time for vehicle development, fueling infrastructure modifications and misfueling prevention measures. In support of this notion, and to avoid a continually moving target, Toyota stands ready and willing to develop E20 compatible vehicles in the future provided these issues are addressed.

We welcome the opportunity to work with key stakeholders in Congress, the regulatory agencies, the auto industry, the fuel industry and others to examine a practical pathway forward. Please contact me if you have any questions or need any additional information.

Sincerely,

Thomas J. Lehner
Vice President, Government & Industry Affairs
Toyota Motor North America

VOLKSWAGEN

GROUP OF AMERICA

MICHAEL LOHSCHELLER
EXECUTIVE VICE PRESIDENT &
CHIEF FINANCIAL OFFICER

PHONE +1 703 364 7300
FAX +1 703 364 7031
MICHAEL.LOHSCHELLER@VW.COM

VOLKSWAGEN GROUP OF AMERICA, INC.
2200 FERDINAND PORSCHE DRIVE
HERNDON, VA 20171

June 9, 2011

The Honorable F. James Sensenbrenner, Jr.
Vice-Chairman, House Committee on Science, Space, and Technology
U.S. House of Representatives
2449 Rayburn House Office Building
Washington, D.C. 20515-4905

Dear Congressman Sensenbrenner,

Thank you for your June 1 letter to Jon Browning inquiring about Volkswagen Group of America's position on EPA's decision to allow E15 for use in cars and trucks of model year 2001 or later. Mr. Browning is out of the country and has asked that I respond on his behalf. We appreciate your leadership on this issue and support your legislation to block the implementation of this rule. Below please find our responses to your questions.

1. Are you confident that your cars and trucks from model year 2001 and later will not be damaged by or wear more quickly from use of E15?

Volkswagen does not have complete confidence that our vehicles will have no problems related to the use of E15. During the development of existing products no manufacturer tested for E15, since this fuel was not considered as a possible fuel when these vehicles were designed and tested. There is risk that a population of these existing vehicles could experience some type of problem due to E15.

Volkswagen agrees that the EPA did not conduct an adequate test program when E15 was considered and then approved for use in conventional vehicles. The auto and petroleum industry, through the CRC organization, conducted some limited testing of five vehicle areas where it was felt E15 could cause problems with some population of 2001 and newer vehicles. These five areas of concern are the following: base engine durability, catalyst durability, fuel system components, evaporative emissions systems and on board diagnostic (OBD) systems. The CRC testing indicated that some vehicles may be subject to problems related to E15 in the areas mentioned. It is possible that Volkswagen vehicles are included in the population of vehicles that could experience problems.

2. Will your current warranty cover potential problems stemming from the use of E15 in cars and trucks from model year 2001 and later?

No. Our current warranty will not cover problems stemming from the use of E15. Our owner's manuals currently recommend the use of E10 fuels. We disagree with the EPA decision to allow E15 in 2001 and newer vehicles and our advice to our customers is to follow the recommendation found in the owner's manual.

3. Will E15 affect the fuel efficiency of your engines?

Yes, E15 will affect fuel economy negatively. Ethanol has less energy content than gasoline and a higher percentage of ethanol will result in lower fuel economy. Ethanol has higher octane but there is no assurance the increased ethanol will raise the octane of the fuel, since the octane of the base gasoline can be lowered if a higher level of ethanol is used.

In summary, Volkswagen Group of America supports renewable fuels and increased use of ethanol, but disagrees with the EPA's approach to use a higher blend in older vehicles not designed to use this fuel. A more sensible approach is to set a higher level blend in the future with adequate lead time for the industry to design their vehicles to the prescribed higher blend level. The blend level should be set such that the RFS II requirements are fulfilled. The result would be vehicles designed for and optimized to a new higher ethanol fuel. This new fuel should also have a new requirement for a higher octane value that vehicle manufacturers can design to in order to optimize CO2 emissions. Finally, E10 should remain on the market for legacy product.

Again, thank you for recognizing this issue as problematic for manufacturers, and ultimately consumers. Please do not hesitate to contact our Vice President of Government Relations, Anna Schneider, with further questions.

Sincerely,

Michael Lohscheller

cc: Anna Schneider

VOLVO
Volvo Car Corporation

The Honorable F. James Sensenbrenner, Jr., Vice-Chairman
House Committee on Science, Space, and Technology
Room 2449
Rayburn House Office Building
Washington, DC 20515-4905

Date	Telephone incl.calling	Telefax	Our reference
2011-06-02			

Dear Vice-Chairman Sensenbrenner:

In response to your letter of June 1, 2011 regarding possible concerns of Volvo Car Corporation (VCC) and other constituents about EPA's recent approval of a blend of 15 percent ethanol (E15) for use in cars and trucks of Model Year 2001 or later, Volvo would like to offer the following answers to the questions posed in your letter.

1. Damage or wear from the use of E15 in model year 2001 and later Volvo vehicles: Volvo would expect accelerated engine wear and reduced durability over the lifetime of any vehicle engine subjected to E15 use. Field studies done at markets with rising blends above E10 has shown signs of premature ageing of rubber components in the fuel distribution system, which poses an increased risk regarding evaporative emissions. Volvo vehicles currently meet evaporative and exhaust emission performance and durability requirements using fuel containing not more than 10 percent ethanol (E10). While wear and tear at the federal useful life standard of 10 years/120,000 miles would already be concerning, California's Zero Emission Vehicle useful life standard of 15 years/150,000 miles would pose an even greater concern.

   Volvo currently markets modified variants that can handle higher levels of ethanol than E10 in some markets
   - Volvo has not currently scheduled to include variants in the U.S. market that can cope with higher ethanol concentrations than 10%
   - We can not modify already produced cars to minimize the risk of the described customer and environmental problems.

2. Warranty coverage of potential problems stemming from the use of E15: Volvo owner's manual specifies a maximum 10 percent allowable ethanol content. The owner's manual also stresses the importance of proper vehicle care and maintenance, including the use of approved fuels, fluids, and lubricants.

Volvo's warranty, spelled out in a Warranty and Maintenance Records Information booklet, reserves the right to deny warranty coverage for damage caused by or under limited but specific circumstances, which expressly include:

"The use of fuel and/or oil, or other fluids which do not meet the Volvo-approved standards as set forth in the Owner's Manual, Volvo Service Literature or [in this] booklet."

However, it must also be understood that federal law puts the burden on the manufacturer to prove cause of emission failure. Therefore, any manufacturer would be prevented from arbitrarily assigning blame to the use of E15; such a determination must be supported by evidence. That kind of evidence can be elusive, given the uncertainty of histories of use of most motor vehicles.

3. E15's effect on vehicle fuel consumption: Ethanol contains less energy than gasoline. E10 already causes an increase in fuel consumption over unblended fuel. Volvo estimates that an increase in ethanol to 15 percent will degrade fuel economy and increase fuel consumption by a further 2.5 percent.

4. E15, an environmental aspect

Bringing a higher content of ethanol in the existing fuel market can be an opportunity to introduce alternative fuels. If focusing on the environmental aspect, the introduction of alternative fuels is in general a multistep process, the impact on the source of fuel and how it used.
Important environmental benefit is a reduction of the use of fossil fuels and replacing it with renewable fuel. In other words, it affects the CO2 balance positively.
The low-blend of ethanol, E10 and E15, causes fuel consumption to increase as described in paragraph 3 but CO2 emissions are expected to be unchanged or better when used. According to Volvo's calculations, CO2 emissions from E15 will be roughly equivalent to E10.

In this case, where the E15 is made available for all passenger car types from MY2001 designed to E10 but not E15, arises an environmental dilemma. The benefits when you utilize E10 to E15 to reduce CO2 the effect does not occur, it remains unchanged.
As described in paragraph 1, it is Volvo's engineering assessment that there is a likelihood of accelerated engine wear and rubber fuel system components are most likely to age prematurely, thus, adding an emission risk with respect to evaporative emissions.

Volvo's summation leads to the conclusion that by introducing the E15 for variants that are designed to E10, will add to the risk associated with respect to emissions while there is

VOLVO

Volvo Car Corporation

a no significant improvement in CO2 when using E15 instead of E10. Thus arise the conclusion that the risks related to emissions are greater than the benefits in terms of CO2 when using low-blend E15 for variants that are designed to E10. Thank you for considering our views. If you have any questions about the information, please contact Katherine Yehl at kyehl@volvocars.com or (202) 412-5935.

Sincerely,

Doug Speck
President and CEO
Volvo Cars of North America, LLC

HYUNDAI MOTOR COMPANY
Washington Office
1660 L Street, NW, Suite 620
Washington, DC 20036
TEL: (202) 296-5550 FAX: (202) 296-5436

June 30, 2011

The Honorable F. James Sensenbrenner
Vice-Chairman
Committee on Space, Science and Technology
United States House of Representatives
2449 Rayburn House Office Building
Washington, DC 20515-4905

Dear Vice-Chairman Sensenbrenner:

Thank you for your June 1, 2011 letter to John Krafcik, President, Hyundai Motor America ("Hyundai") regarding the Environmental Protection Agency's (EPA) partial waiver decisions permitting the use of gasoline blended with up to 15 percent ethanol (E15) in 2001 model year (MY) and newer passenger cars and light-duty trucks.

Hyundai recommends that before any new fuel is introduced into the marketplace, comprehensive, independent and objective scientific testing be completed to show that the fuel will not increase air pollution, harm engines, or endanger consumers. Further, Hyundai recommends the establishment of adequate protections to prevent misfueling.

Your letter asks for responses to several questions regarding E15. The questions and Hyundai's responses are shown below.

1. Are you confident that your cars and trucks from model year 2001 and later will not be damaged by or wear more quickly for use of E15?

   The EPA tests failed to conclusively show that the vehicles will not be subject to damage or increased wear. Hyundai therefore has no basis to conclude that its vehicles will not be damaged by or wear more quickly due to the use of E15.

2. Will your current warranty cover potential problems stemming from the use of E15 in cars and trucks from model year 2001 and later?

   Hyundai owner's manuals state: "Vehicle damage or drivability problems may not be covered by the manufacturer's warranty if they result from the use of gasohol containing more than 10 percent ethanol..." The manuals also state "Do not use gasohol (gasoline-ethanol mixture) containing more than 10 percent ethanol...".

3. Will E15 affect the fuel efficiency of your engines?

   E15 will negatively affect the fuel efficiency of Hyundai engines because ethanol has lower energy content than gasoline.

Thank you for the opportunity to share our recommendations and to respond to your questions. If you have any questions about this information, please me at kmhennessey@hyundai-dc.com or at 202-296-5550.

Sincerely,

Kathleen M. Hennessey
Vice President – Government Affairs

cc: The Honorable Ralph Hall
Chairman, Committee on Science, Space and Technology

The Honorable Eddie Bernice Johnson
Ranking Member, Committee on Science, Space and Technology

John Krafcik
President, Hyundai Motor America

NISSAN

Andrew J. Tavi
VP Legal and Government Affairs,
and General Counsel

NISSAN NORTH AMERICA, INC.
Corporate Office
One Nissan Way
Franklin, TN 37067
Mailing Address: P.O. Box 685001
Franklin, TN 37068-5001
Telephone: 615.725.2252
Fax: 615.807.3050

June 17, 2011

The Honorable F. James Sensenbrenner, Jr.
Vice Chairman
House Committee on Science, Space and Technology
United States House of Representatives
2449 Rayburn House Office Building
Washington, DC 20515-4905

Dear Vice Chairman Sensenbrenner:

We appreciate receiving your letter dated June 1, 2011 regarding EPA's two partial waiver decisions that permit the sale of gasoline containing up to 15 percent ethanol (E15) for 2001 model-year (MY) and newer passenger cars and light trucks. We believe that increasing the allowable ethanol content in gasoline by 50 percent will have unintended consequences for auto manufactures, consumers, fuel suppliers and distributors. Nissan's primary concern about these E15 waivers is the overriding need for consumer safety and satisfaction.

Specifically, your letter asks for responses to the following three questions. Our responses are provided below.

1. **Are you confident that your cars and trucks from model year 2001 and later will not be damaged by or wear more quickly from use of E15?**

   No, we are not at all confident that there will not be damage to MY 2001 and later vehicles that are fueled with E15. In our view the record fails to demonstrate that motor vehicles (other than FFVs) would not be damaged and result in failures when run on E15.

2. **Will your current warranty cover potential problems stemming from the use of E15 in cars and trucks from model year 2001 and later?**

   No. Nissan vehicles covered by the waiver were designed to use a maximum of E10. The direction in the owner manuals of Nissan vehicles reflects the fact that they were not designed to run on E15. EPA regulations allow manufactures to deny warranty coverage for vehicles damaged due to mis-fueling (based on the owner's manual instructions). We are encouraging Nissan vehicle owners to continue to consult their owner's manuals for information regarding the appropriate fuel for the vehicles.

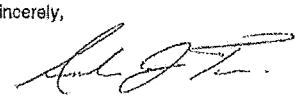
3. **Will E15 affect the fuel efficiency of your engines?**

   Yes. A gallon of ethanol has lower energy content than a gallon of gasoline. Therefore, any increase in ethanol content will necessarily degrade fuel economy.

This communication may contain information that is proprietary, privileged, confidential or otherwise legally protected from disclosure, and is intended solely for the use of the intended recipient(s). If you are not an intended recipient, or a person responsible for delivering this transmission to an intended recipient, please do not read, print, retain, copy or disseminate this transmission in error. Please delete and immediately notify the sender of the error.

Thank you for considering our views. If you have any questions about this information, Please contact Tracy Woodard at tracy.woodard@nissan-usa.com or 615-725-2377.

Sincerely,



Andrew J. Tavi
Vice President, Legal and Government Affairs,
and General Counsel

CC: The Honorable Ralph Hall
Chairman, Committee on Science, Space and Technology

The Honorable Eddie Bernice Johnson
Ranking Member, Committee on Science, Space and Technology

Senator BOXER. Thank you, Senator.

The memorial has started. So, Senator Fischer, you will finish it up.

Senator FISCHER. Thank you, Madam Chairman. Of course I am going to be directing my questions to my fellow Nebraskan. So, welcome again, Jon, for being here.

I appreciated your comments to the Chairwoman as you answered her questions with regards to the impact on rural economies on agriculture as a whole if the RFS is changed. When we talk about higher corn prices, I am a cattle rancher, so I certainly understand the impact of those higher prices and what they do to my industry as well. But I am fully supportive of ethanol because of the good economic impact is has had on rural communities, rural States and truly our country as a whole.

With that, I would like to get your response on a couple of issues that were brought up today. The RFS requires that corn and other feed stuffs used to produce renewable fuels from the RFS only be sourced from land that was already engaged in agriculture production in 2007 and feed stuffs that are grown on land converted to crop land after 2007, they do not qualify for that renewable biomass. I think that is a point that we need to reinforce here.

We have heard about wetlands being plowed up. We have heard about prairies being plowed up. We have heard about the use of water when we talk about the production of ethanol. Can you specifically address land use issues and water? You know, in Nebraska we are very fortunate that we have the Ogallala Aquifer which I am on top of the Ogallala Aquifer as you are down in Paxton as well. Could you address those?

Mr. HOLZFASTER. Sure. Under the current Farm Bill, there are swamp buster and sod buster provisions that prevent me from doing any type of that conversion. That misinformation has been out there, as Mr. Coleman has stated.

When you talk about water in Nebraska, it is a tremendous resource, one that we strive tirelessly to protect and use efficiently. We, in agriculture, have been accused of creating dirty air and dirty water and that, in all due respect, Mr. Faber, hurts. I breathe that air. I drink that water.

I love this town, but one thing I look forward to is going home and breathing that air and drinking that water. I know it is safe, I know it is clean, and I would have it no other way. It is who I am, it is what I am, it is where my family lives. So, that is painful to hear those terms put out there. It is not, that is where we are at. We want clean air and water as much as anyone else.

As far as the protection of that resource, I have been farming for 27 years and in those years, I am growing approximately 50 percent more corn on 50 percent less water. The technology that has been available to modern agriculture has been tremendous in that efficiency, in the efficient use of water.

Senator FISCHER. And how much water does an ethanol plant use? What would you compare it to?

Mr. HOLZFASTER. A 50 million gallon a year ethanol plant uses about as much water as a 9-hole golf course. It is a lot of water. It takes a lot of water to run a 9-hole golf course and it does an ethanol plant as well. But that is efficient and good use of water.

Senator FISCHER. Thank you.

I would like to say to all of you I appreciate you coming in. I think we have to have a balance when we talk about our energy resources and how we develop those in the future. Thank you very much.

Thank you, Madam Chair.

Senator BOXER. Thank you.

I want to thank everyone for all of your cooperation. I am sorry we had a couple of sort of strange personal attacks. I was blindsided by that.

But clearly we are on the verge of technological breakthroughs that can make America more secure, that will make America more secure. And, as Chairman of this Committee, and I have the gavel for now, I am not going to let us reverse course on that. I just am not. Now, no program is perfect, that is for sure, whatever it is. And even in the private sector no new product is perfect and no new marketing strategy is perfect at first.

So, we have got to work together and I am willing to do that. But I just think that, overall, let us not turn our back on a way to make sure that we can become more energy independent and have a better environment in the long run, making sure that we do stress those non-food sources I think in the future is very important.

I want to thank all of you. This was a tough hearing because we had to push so fast. And we know that EPA has a lot of authority under current law to respond to some of the things that were said here, on all sides. And they have got a hard job. But, you know, they have to keep politics out of it and go by the facts. And remember that show a long time ago, Show My Age? Only the facts, Madam, that was that show. Most people here were not even born when I watched that show.

So, we will move forward with the facts. And I also want to say that Senator Fischer, she played a very important role in finding us this, I think, star witness today, our farmer who is dealing with this on the ground and he can testify to what is working and what is not. And he does not really have that, in my opinion, that special agenda that others may bring to the table. So, thank you so much, sir.

And thanks to everybody in the audience.

We stand adjourned.

[Whereupon at 11:15 a.m. the Committee was adjourned.]

[Additional material submitted for the record follows:]

Eliminate the Corn Ethanol Mandate

An Open Letter to Congress

December 10, 2013

Dear Congress:

Recently the Environmental Protection Agency (EPA), which is charged with implementing and administering the Renewable Fuel Standard (RFS), released its proposal for the amount of biofuels that must be blended into the nation's fuel supply in 2014. As you may know, the bulk of the RFS mandate is filled by corn ethanol, which now consumes approximately 40% of the corn produced in the U.S. annually. Although the EPA is proposing a minor reduction in the overall volume of biofuels required by the mandate, thus deviating slightly from the RFS statute, this reduction will do little to reduce ethanol's share of the annual corn crop and virtually nothing to alleviate the broad economic and environmental damage currently caused by using corn for fuel.

In short, the EPA's proposal is a small step in the right direction—but is clearly insufficient to effectively address this harmful federal policy. Only Congress can solve this problem. We urge you to act now to eliminate the corn ethanol mandate in the RFS.

There are several bills that have been introduced in both Houses of Congress to achieve this result, and more are on the way. Please support one or more of these bills, today.

Sincerely,

ActionAid USA
American Bakers Association
American Frozen Food Institute
American Meat Institute
Association of Kentucky Fried Chicken Franchisees
California Dairy Campaign
California League of Food Processors
Competitive Enterprise Institute
Council for Citizens Against Government Waste
Dairy Producers of New Mexico
Dairy Producers of Utah
Environmental Working Group
Freedom Action
Friends of the Earth
Idaho Dairymen's Association
International Dairy Foods Association
International Foodservice Distributors Association
Marine Retailers Association of the Americas
Milk Producers Council
National Chicken Council
National Council of Chain Restaurants
National Franchisee Association
National Frozen Pizza Institute
National Grocers Association
National Marine Manufacturers Association
National Restaurant Association
National Taxpayers Union
National Turkey Federation
Nevada State Dairy Commission
North American Meat Association
Northwest Dairy Association/Darigold
Oregon Dairy Farmers Association
Oxfam America
R Street Institute
Snack Food Association
Southeast Milk, Inc.
Taxpayers for Common Sense
Taxpayers Protection Alliance
Washington State Dairy Federation
Western United Dairymen

December 11, 2013

The Honorable Barbara Boxer
United States Senate
Washington, DC 20510

The Honorable David Vitter
United States Senate
Washington, DC 20510

Dear Chairman Boxer and Ranking Member Vitter:

We, the undersigned diverse array of agriculture, business, environment, food retail, hunger, taxpayer, and public interest and consumer groups, commend the Senate Environment and Public Works Committee for holding a hearing to conduct oversight of the Renewable Fuel Standard (RFS). We write today to share our support for meaningful Congressional action to address the myriad of issues with the RFS program. However, we do want to draw the committee's attention to our disappointment in the lack of including critical stakeholders in your hearing process. Given the significant interest in the RFS, we think the Committee missed a great opportunity to include a robust panel that would fully illustrate the daily realities and diverse impacts of this policy on so many sectors of the population.

While our reasons vary, all of us have long maintained that the RFS is a uniquely flawed policy. The mandate on corn-based ethanol in particular has had a devastating effect on the entire food economy from livestock and poultry producers facing record feed costs, to food retailers facing record food costs, to consumers struggling to balance food budgets in tough economic times. Some signers of this letter also question the propriety of Congress establishing production quota and guaranteed market shares for any type of commercial business. Ethanol from corn also is concerning to some due to its global warming impact and the use of natural resources such as water and native grassland for producing fuel. The corn-based ethanol mandate is also having a devastating impact in communities throughout the world, where people living in poverty are facing increased food prices that threaten their food and land security.

Corn ethanol has cost taxpayers billions of dollars in tax credits, tariffs, and other subsidies over the past thirty years; while the most expensive tax credit – the Volumetric Ethanol Excise Tax Credit - expired at the end of 2011, ethanol subsidies live on through farm bill energy title programs and other federal incentives. All of these concerns are in addition to concerns over higher blends of ethanol in the fuel system that have created significant safety and liability problems with boats, recreation and lawn equipment, as well as motorcycles and legacy vehicles.

Although the problems created by the RFS in terms of RINs and the approaching "blend wall" are significant and need to be addressed, so too do the problems the RFS imposes on the food chain, consumers, taxpayers, and the environment. Indeed, although EPA's recent proposal to freeze ethanol blending targets is a step in the right direction, it does not address the multitude of other issues with the RFS and should be a signal it is time for Congress to take the difficult steps needed toward real reform. Our organizations strongly support Congressional action to enact significant, meaningful and permanent decreases in the conventional biofuels (corn ethanol) mandate and other reforms as needed.

Thank you for considering these views.

Sincerely,

ActionAid USA
American Meat Institute
American Sportfishing Association
American Bakers Association
Boat U.S.
California Dairy Campaign
Clean Air Task Force
Dairy Producers of New Mexico
Dairy Producers of Utah
Friends of the Earth
Idaho Dairymen's Association
Milk Producers Council
National Council of Chain Restaurants
National Taxpayers Union
National Turkey Federation
Nevada State Dairy Commission
Northwest Dairy Association / Darigold
Oregon Dairy Farmers Association
Oxfam America
Southeast Milk, Inc.
Specialty Equipment Market Association
Washington State Dairy Federation

Air Resources Board

Mary D. Nichols, Chairman
1001 I Street • P.O. Box 2815
Sacramento, California 95812 • www.arb.ca.gov

Matthew Rodriquez
Secretary for
Environmental Protection

Edmund G. Brown Jr.
Governor

November 6, 2012

Mr. Wayne Allard
Vice President, Government Relations
American Motorcyclist Association
wallard@ama-cycle.org

Dear Mr. Allard:

Thank you for your letter of October 16th to Air Resources Board (ARB) Chairman Mary Nichols, wherein you expressed concern about potential misfueling of E15 into motorcycles and all-terrain vehicles, which are not approved for E15 use. Chairman Nichols has asked me to respond to your letter.

As you stated, misfueling is possible through blender pumps that dispense both E10 and E15 when residual E15 is left in the dispenser hose. To address potential misfueling issues with non-approved vehicles, the U.S. Environmental Protection Agency (U.S. EPA) approved a Misfueling Mitigation Plan that, as one of its conditions, mandates consumers purchase at least four gallons of E10 fuel if purchasing from a blender pump that dispenses both E10 and E15. Your concern is that motorcycles have small gas tanks; therefore, the four-gallon minimum purchase is problematic. Consequently, the chance of putting fuel into these vehicles with an ethanol content higher than E10 is still of concern.

Please be advised that E15 is not approved for sale in California, and if ARB chooses to allow E15 as a transportation fuel, it would take several years to complete the vehicle testing and rule development necessary to introduce a new transportation fuel into California's market. Meanwhile, U.S. EPA has committed to "closely follow the results of their E15 Compliance Survey to determine whether additional misfueling mitigation measures are necessary." We will follow U.S. EPA's continued assessment of E15 misfueling and will keep in mind these concerns should we move forward with allowing E15 in California.

Thank you again for writing. If you have any questions or need further information, please contact me at (916) 322-6020 or by email at mwaugh@arb.ca.gov.

Sincerely,

Michael S. Waugh, Chief
Transportation Fuels Branch

February 6, 2012

The Honorable Ralph Hall
Chairman
House Committee on Science, Space and Technology
2321 Rayburn House Office Building
Washington, D.C. 20515

The Honorable Eddie Bernice Johnson
Ranking Member
House Committee on Science, Space and Technology
394 Ford House Office Building
Washington, D.C. 20515

The undersigned organizations urge you to support H.R. 3199. This important piece of legislation would require the Environmental Protection Agency (EPA) and the National Academy of Sciences (NAS) to conduct necessary scientific and technical analysis on the implications of introducing mid-level ethanol blends into the marketplace before EPA moves forward with registering such fuels.

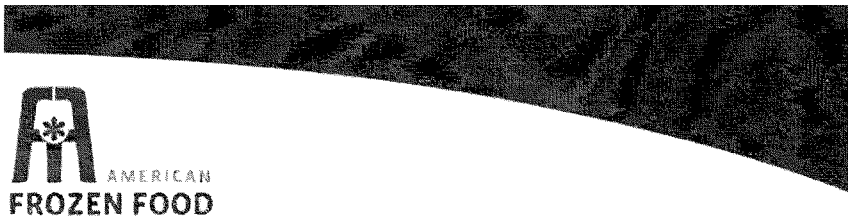
Several objective studies indicate that significantly more research and testing needs to be completed before gasoline containing 15 percent ethanol, known as "E15," or other mid-level ethanol blends can be introduced into commerce. H.R. 3199 will require the NAS and EPA to conduct a necessary comprehensive assessment of the testing that has been conducted and still needs to be done of on-road, off-road, and marine engines, vehicles and related equipment prior to the implementation of any waiver for mid-level ethanol blends. This bill takes a critical step towards ensuring that any mid-level ethanol blends are introduced into commerce in a manner that protects consumers and the environment.

While our organizations have divergent priorities, consumer protection is a common high priority and we are united in opposition to the premature introduction of E15. Simply stated, this bill will halt EPA's rush to introduce mid-level ethanol blends and ensure such fuel blends receive the proper scientific analysis before being put into the marketplace.

We collectively urge you to support Representative Sensenbrenner's legislation (H.R. 3199).

Sincerely,

Alliance of Automobile Manufacturers
American Frozen Food Institute
American Fuel & Petrochemical Manufacturers
American Bakers Association
American Meat Institute
American Petroleum Institute
Association of Global Automakers
Boat Owners Association of The United States
California Dairy Campaign
Competitive Enterprise Institute
Freedom Action
Friends of the Earth
Grocery Manufacturers Association
International Liquid Terminals Association
International Snowmobile Manufacturers Association
Milk Producers Council
Motorcycle Industry Council
National Association of Shell Marketers
National Black Chamber of Commerce
National Council of Chain Restaurants
National Marine Manufacturers Association
National Meat Association
National Restaurant Association
National Turkey Federation
Outdoor Power Equipment Institute
Recreational Off-Highway Vehicle Association
Small Business & Entrepreneurship Council
Snack Food Association
Southeast Milk Inc.
Specialty Equipment Market Association
Specialty Vehicle Institute of America



AMERICAN
FROZEN FOOD
INSTITUTE

December 6, 2013

The Honorable John Barrasso
United States Senate
307 Dirksen Senate Office Building
Washington, D.C. 20510

Dear Senator Barrasso:

On behalf of the American Frozen Food Institute (AFFI), I am writing to express support for the "Renewable Fuel Standard Repeal Act" (S. 1195). AFFI supports your efforts to repeal the Renewable Fuel Standard (RFS).

AFFI is the sole association that represents all sectors of the frozen food industry, with more than 500 member companies that produce and distribute frozen foods to consumers throughout the United States and around the world. Our members are responsible for approximately 90 percent of the frozen food produced annually in the United States, valued at more than $70 billion.

AFFI believes that food-based commodities should be used to fuel bodies, not vehicle engines, particularly given the tremendous impact the RFS is having on the costs and prices food makers and grocery shoppers must bear. In fact, the shrinking supply of corn grown for food consumption has caused food prices to spike nearly 18 percent, raising food costs for a family of four between $1,344 and $2,658 per year, according to a study conducted by the National Council of Chain Restaurants.

AFFI believes the RFS is unnecessary, unworkable and must ultimately be eliminated. As such, we support your continued efforts to shield food makers and consumers from the costs of an overly aggressive and unrealistic ethanol and biofuels mandate. We stand ready to work with you on this important issue.

Sincerely yours,

Kraig R. Naasz

Kraig R. Naasz
President & CEO
American Frozen Food Institute

2000 Corporate Ridge | Suite 1000 | McLean, Virginia 22102 | 703.821.0770 (p) | 703.821.1350 (f) | info@affi.com | www.affi.com

cc: The Honorable John Boozman
The Honorable Saxby Chambliss
The Honorable Ted Cruz
The Honorable Michael Enzi
The Honorable Mark Pryor
The Honorable Tim Scott
The Honorable Pat Toomey

December 9, 2013

AMERICAN HIGHWAY USERS ALLIANCE

Hon. John Barrasso, M.D.
United States Senate
307 Dirksen Senate Office Building
Washington, DC 20510

Dear Senator Barrasso:

The Renewable Fuels Standard (RFS) was developed based on faulty assumptions about future consumption of fuel, the environmental benefits of corn-based ethanol, the percentage of ethanol in fuel needed to meet the mandate, and the price-volatility of tradable renewable identification number (RINs). As a result, the current standard is a serious problem for America's highway users.

For many motorists and motorcycle riders, gasoline with more than 10% ethanol content can damage c destroy engines, void vehicle warranties, and reduce fuel economy. We fear the presence of these higher blends would go unnoticed by many motorists and motorcycle riders until the damage has already caused serious harm to their engines. In addition, the cost to refiners of purchasing volatile RIN to avoid the "blend wall" is passed on to consumers, who are the ultimate victims of this trading scheme.

The Environmental Protection Agency has acknowledged the problem by proposing using its administrative authority to reduce the number of gallons mandated in 2014. We support this proposal. However, this is a temporary fix for one year. A permanent fix is needed and requires legislation. One option to solve the problem permanently is to repeal the RFS, which you have proposed with Senators Pryor and Toomey.

On behalf of the American Highway Users Alliance, an 81-year old advocacy organization representing motorists, motorcyclists, truckers, bus companies, RVers, and a diverse cross section of businesses with vehicle fleets, I am pleased to offer our support for the Renewable Fuel Standard Repeal Act.

We urge all Senators to support S. 1195 and stand ready to assist you as you move the bill forward.

Sincerely,

Gregory M. Cohen

Gregory M. Cohen, P.E.
President & CEO

July 24, 2013

Dear Senator Barrasso:

On behalf of more than two million Americans for Prosperity activists in all 50 states, I applaud you for introducing legislation that would repeal the federal Renewable Fuel Standard (RFS) (S. 1195). This would eliminate the government mandate that refiners blend a certain amount of biofuel in gasoline, and it would have a positive impact on household budgets.

Coupled with other tax preferences for renewable fuel, the RFS leads to higher prices at the grocery store and the gas pump. This is a de-facto tax on American families, falling particularly hard on low-income people who spend a greater percentage of their income on food and fuel.

The RFS distorts agricultural markets considerably. This mandate encourages farmers to shift corn production away from food and feedstock, as well as to scale back their production of other commodities such as soybeans and wheat. The ultimate result is more expensive groceries—recent research from Purdue University shows that repealing the RFS would cause overall food prices to fall approximately 13 percent.

Increasingly, the RFS fails to match up with current economic realities. Beginning in 2014, for instance the RFS effectively requires gasoline refiners to blend volumes of advanced biofuels (e.g., cellulosic ethanol) that are not currently commercially available—the so-called "blend wall." This forces refiners to choose between purchasing expensive RIN credits and paying a fine for failing to purchase a product that does not exist in the marketplace.

Energy technologies should compete in the open marketplace on their merits, without the protection of government mandates. No longer should government officials attempt to replace market forces with their own preferences at the expense of American consumers. Americans for Prosperity is proud to support S.1195, your legislation to repeal the RFS. I urge your colleagues to support its passage, and I look forward to working with you in the future.

Sincerely,

Christine Harbin Hanson

Christine Harbin Hanson
Policy Analyst
Americans for Prosperity

Americans for Prosperity® (AFP) is a nationwide organization of citizen leaders committed to advancing every individual's right to economic freedom and opportunity. AFP believes reducing the size and scope of government is the best safeguard to ensuring individual productivity and prosperity for all Americans. AFP educates and engages citizens in support of restraining state and federal government growth and returning government to its constitutional limits. AFP has more than 2 million members, including members in all 50 states, and 36 state chapters and affiliates. More than 90,000 Americans in all 50 states have made a financial investment in AFP or AFP Foundation. For more information, visit www.americansforprosperity.org. Americans for Prosperity does not support or oppose candidates for public office.

###

FROM : COMO BELMORE PHONE NO. : 508 699 4856 Dec. 07 2013 06:21PM P1

NATIONAL BOATING FEDERATION

4 December 2013

Senator John Barrasso
307 Dirksen Senate Office Building
Washington, DC 20510

Re: S1195 Renewable Fuel Standards Repeal Act

Dear Senator Barrasso:

The National Boating Federation which represents approximately 2 Million Recreational Boaters fully supports the Renewable Fuel Standards Repeal Act S1195.

The mandatory addition of Ethanol to fuel supplies has created a situation where all boaters are finding they have serious problems with their engines and generators due to damage caused by the Ethanol.

It is our hope that your bill will be successful.

Respectfully

Carolyn Belmore
President
National Boating Federation
112 Saddleback Lane
E. Falmouth, MA 02536

National Marine Manufacturers Association

June 13, 2013

The Honorable John Barrasso
United States Senate
307 Senate Dirksen Office Building
Washington, DC 20510

Re: **Renewable Fuel Standard Repeal Act**

Dear Senator Barrasso:

The National Marine Manufacturers Association (NMMA) is writing to offer its support for S. 1195, the Renewable Fuel Standard Repeal Act. We applaud the legislation's effort at eliminating the current system of ever-increasing levels of ethanol in the nation's fuel supply.

NMMA is the leading trade association representing the recreational boating industry in North America. NMMA member companies produce more than 80 percent of the boats, engines, trailers, accessories and gear used by boaters and anglers throughout the United States and Canada. Recreational boating has an estimated annual economic impact of $72 billion. Eighty-three million Americans participated in boating in 2011. Importantly, an estimated 83 percent of boats sold in the U.S. in 2011 were made in the U.S.

One of the greatest concerns facing the recreational boating industry today relates to the Renewable Fuel Standard, specifically the introduction of E15 into the marketplace. Marine and other small gasoline-powered engines are designed to run on levels of ethanol at 10% volume or lower. That means that anything above E10 poses serious problems, including performance issues like stalling, corrosion leading to oil or fuel leaks, increased emissions and damaged valves, rubber fuel lines and gaskets. The potential for consumers to use fuel with a percentage of ethanol above 10 percent in boat engines is detrimental to the $121 billion per year U.S. recreational boating industry, an important economic driver for large parts of the country.

Again, NMMA offers its support for S. 1195 and we thank you for your valuable leadership on this and many other issues of great importance to the recreational boating community. Please let me know if we can be of any assistance to you on this important matter by contacting Jeff Gabriel ((202) 737-9776; jgabriel@nmma.org).

With warm regards,

Thomas J. Dammrich
President

Executive Committee
Chairman, NMMA
David Sikkens
Tiara Yachts

Vice Chairman, NMMA
Jason Pajonk-Taylor
Taylor Made Products

Secretary, NMMA
Mark Schwabero
Mercury Marine

EMD Representative
Paul Dieriksen
Volvo Penta

Member At-Large
Chuck Rowe
Indmar

Treasurer, NMMA
Joan Maxwell
Regulator Marine

BMD Representative
John Dorton
MasterCraft Boats

AMD Representative
Fred Shorrard
ASA Electronics

President
Thomas J. Dammrich
NMMA

[illegible] North Capitol Street NW, Suite [illegible]
Washington, D.C. 20001
(202) 737-9766 Fax: 202-[illegible]
nmma.org

June 28, 2013

The Honorable John Barrasso
United States Senate
307 Dirksen
Washington, DC 20510

The Honorable Mark Pryor
United States Senate
255 Dirksen
Washington, DC 20510

The Honorable Pat Toomey
United States Senate
248 Russell
Washington, DC 20510

Dear Senators Barrasso, Pryor, and Toomey:

On behalf of the 362,000-member National Taxpayers Union (NTU), I write in support of your "Renewable Fuel Standard [RFS] Repeal Act," S. 1195. This legislation would fully repeal the broken RFS mandates entirely, ending the additional costs they impose upon consumers on everything from food to transportation.

In the wake of last summer's devastating drought, and as refiners warn of the approaching "blend wall," the original goals of the biofuels mandates as set forth in the Energy Policy Act of 2005 have become obscured by the destructive unintended consequences of these policies. The advanced cellulosic biofuels meant to relieve our economy's dependence on traditional fuels have not come to fruition. Lack of flexibility and common sense on the part of the law and administrators have caused gallons upon gallons of costly corn ethanol to be mixed with our fuel supply to meet arbitrary standards despite falling fuel consumption.

For taxpayers, the market distortions imposed by the RFS mandates have been challenging. Higher blends of ethanol in the fuel supply increase the risk of engine damage. Ethanol's lower fuel economy means that consumers have to refill their gas tanks more often, especially painful when fuel prices are already very high. Record-high corn prices have also led to increased pressure on other grains such as soy and wheat, both of which have jumped in prices and are found in animal feed and numerous food products. Experts at the agriculture investment house Rabobank estimate there will be a 14 percent jump in overall food prices in the next year, a historic increase.

With budgets already stretched thin, American families shouldn't have to pay the price for these damaging mandates. According to the Bureau of Labor Statistics, in 2010 consumers spent, on average, 13 percent of their annual expenditures on food. For poor families, this percentage is even higher, meaning the burden of this government policy falls disproportionately on the shoulders of those who can least afford it.

After years of economic struggle, American consumers need a break. This legislation would immediately open up the corn market, create a level playing field for biofuels, and relieve the pressure on everyone from food producers to families. S. 1195 would correct a serious Congressional overreach, and NTU applauds you for your concerted bipartisan effort. NTU is pleased to endorse the "Renewable Fuel Standard Repeal Act" and we urge all Senators to co-sponsor this legislation and work toward its swift enactment.

Sincerely,

Nan Swift
Federal Affairs Manager

108 North Alfred Street ★ Alexandria, Virginia 22314 ★ Phone: (703) 683-5700 ★ Fax: (703) 683-5722 ★ Web: www.ntu.org

BARBARA BOXER, CALIFORNIA, CHAIRMAN
MAX BAUCUS, MONTANA
THOMAS R. CARPER, DELAWARE
BENJAMIN L. CARDIN, MARYLAND
BERNARD SANDERS, VERMONT
SHELDON WHITEHOUSE, RHODE ISLAND
TOM UDALL, NEW MEXICO
JEFF MERKLEY, OREGON
KIRSTEN GILLIBRAND, NEW YORK
MARK WARNER, VIRGINIA
DAVID VITTER, LOUISIANA
JAMES M. INHOFE, OKLAHOMA
JOHN BARRASSO, WYOMING
JEFF SESSIONS, ALABAMA
MIKE CRAPO, IDAHO
ROGER WICKER, MISSISSIPPI
JOHN BOOZMAN, ARKANSAS
DEB FISCHER, NEBRASKA
BETTINA POIRIER, MAJORITY STAFF DIRECTOR
ZAK BAIG, REPUBLICAN STAFF DIRECTOR

United States Senate

COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS
WASHINGTON, DC 20510-6175

December 11, 2013

The Honorable Adam Sieminski
Administrator
U.S. Energy Information Administration, EI-1
1000 Independence Avenue SW
Washington, DC 20585

Dear Mr. Sieminski:

I am disappointed that, despite our request, the U.S. Energy Information Administration (EIA) was not invited to testify at the joint Senate Committee on Environment and Public Work and Subcommittee on Clean Air and Nuclear Safety hearing entitled "Oversight Hearing on Domestic Renewable Fuels" held on December 11, 2013.

As the EIA is the statistical and analytical agency within the U.S. Department of Energy that collects, analyzes, and disseminates independent and impartial energy information to promote sound policymaking, efficient markets, and public understanding regarding energy and its interaction with the economy and the environment. I looked forward to hearing from you regarding EIA's data and analysis that bears directly on the Renewable Fuel Standard (RFS) program.

In order to conduct meaningful and impartial oversight into the RFS program and gain a further understanding of its ongoing status and implementation challenges, I ask that EIA provide the information, data, and analysis in response to the following questions:

1. Please go back to your AEO 2007 long-term projections for gasoline that were made prior to the formulation of the RFS2 and tell us what percent of that gasoline demand the RFS2 corn-based ethanol requirements would be in 2014. Please do the same for the year 2022 using your AEO 2007 projection and the 2022 RFS2 corn-based ethanol requirement.

2. Looking at your latest short-term energy outlook, what percent of your current 2014 gasoline projection is the statutory RFS2 corn-based ethanol requirement? Using your most recent long-term projection, what percent of gasoline consumption in 2022 would the D6 RIN requirement (corn-based ethanol) represent?

PRINTED ON RECYCLED PAPER

3. What was the average percent of ethanol consumed in the gasoline pool in 2012? What is that percent year-to-date in 2013 for the data that you have available?

4. Would you say that projected ethanol use in 2013 and 2014 will fall short of the corn-based ethanol (D6 RIN) mandate alone?

5. Do you have any information on the use of E85 in 2013? Do you see fast enough market penetration of this fuel in 2014 to meet the statutory corn-based ethanol (D6 RIN) requirement?

6. Can you explain what some people have referred to as the "ethanol shuffle" – i.e., exporting corn-based ethanol while importing sugar-based ethanol in order to meet one of the advanced fuel requirements of the RFS2? What have we seen historically for ethanol imports and exports?

7. As part of the implementation of the RFS2, you provide input to EPA on the potential for cellulosic fuel production in the upcoming year. While EPA's estimates have exceeded your estimates historically, your estimates have also been high. Can you describe your methodology and the problems with making such projections? Are there ways to adjust that methodology to try to improve accuracy?

8. Your latest long-term forecast does not meet the RFS2 requirements. Please describe the major areas where you see difficulties arising. In particular, please address the projections and associated uncertainties in your forecast concerning:

a. Speed with which ethanol gasoline blends higher than E10 can penetrate the market

b. The breakdown and penetration of RFS2 advanced biofuels:

1) Biomass-based biodiesel penetration – feedstock preferences/issues (availability, cold weather gelling issues favoring one feedstock/process versus another, etc.), impacts on penetration from additional infrastructure needed to carry and store the fuel, vehicles to use higher blends, etc.

2) Cellulosic volume projections (both in aggregate and broken out into types, especially cellulosic ethanol, drop-in fuels, other cellulosic)

3) Other advanced biofuels (i.e., not cellulosic or biomass based diesel): again in aggregate and by type (other advanced ethanol, drop-in-fuels, and other)

Thank you for your attention to this matter. I respectfully request your response by December 30, 2013.

Sincerely,

David Vitter
Ranking Member
Environment and Public Works

ABA News
Press Release from the American Bakers Association
www.americanbakers.org

FOR IMMEDIATE RELEASE
July 23, 2013
Contact: Rasma Zvaners, Policy Director
E-mail: rzvaners@americanbakers.org
Ph: 202-789-0300

Bakers Continue Pressing for Changes to the Corn-Based Ethanol Program

Statement from ABA President & CEO Robb MacKie on "The Renewable Fuel Standard Repeal Act" (S. 1195):

"The corn-based ethanol program and the Renewable Fuel Standard (RFS) continue taking their toll on the baking industry and consumers. Corn-based ethanol has accelerated the decrease of wheat acreage in the U.S. over the past 30 years and tightened food supplies around the world."

"Bakers thank Senators John Barrasso (R-WY), Mark Pryor (D-AR) and Pat Toomey (R-PA) for their leadership in introducing "The Renewable Fuel Standard Repeal Act" (S. 1195). This legislation is a step in the right direction. The American Bakers Association looks forward to working with Members of Congress to facilitate change."

###

About the American Bakers Association:
The American Bakers Association (ABA) is the Washington D.C.-based voice of the wholesale baking industry. Since 1897, ABA has represented the interests of bakers before the U.S. Congress, federal agencies, and international regulatory authorities. ABA advocates on behalf of more than 700 baking facilities and baking company suppliers. ABA members produce bread, rolls, crackers, bagels, sweet goods, tortillas and many other wholesome, nutritious, baked products for America's families. The baking industry generates more than $102 billion in economic activity annually and employs more than 633,000 highly skilled people.

NEWS RELEASE

AFPM
American Fuel & Petrochemical Manufacturers

FOR IMMEDIATE RELEASE

Thursday, June 20, 2013

Media Contacts:
Rebecca Adler - 202-552-8485
Diana Cronan - 202-552-4362
media@afpm.org

AFPM Endorses Renewable Fuel Standard Repeal Act

WASHINGTON – The American Fuel & Petrochemical Manufacturers (AFPM) applauds and strongly endorses The Renewable Fuel Standard Repeal Act (S.1195), proposed bi-partisan legislation introduced by Sens. John Barrasso (R-WY), Mark Pryor (D-AR) and Pat Toomey (R-PA).

The stated purposed of the Renewable Fuel Standard was to reduce dependence on foreign oil, enhance air quality and to stimulate development of alternative fuels. Yet, eight years later the RFS is working contrary to those objectives.

"There is a growing consensus among consumers and lawmakers that the RFS is fundamentally broken. The likelihood that the RFS will ever work is as probable as clean air in Beijing next week," said AFPM President Charles T. Drevna.

Despite its original intent, the negative impacts created by the RFS can no longer be ignored. Consumers are paying more at the pump and the grocery store. This broken policy will also force fuels into the marketplace that are incompatible with engines, be they auto, marine or outdoor power equipment. In addition, the RFS will actually threaten air and water quality in the United States.

"AFPM commends Sens. Barrasso, Pryor and Toomey for their strong leadership on a bill that represents the only true solution to addressing the failure of this broken policy," Drevna concluded.

###

About AFPM

AFPM, the American Fuel & Petrochemical Manufacturers is a trade association representing high-tech American manufacturers of virtually the entire U.S. supply of gasoline, diesel, jet fuel, other fuels and home heating oil, as well as the petrochemicals used as building blocks for thousands of vital products in daily life. AFPM members make modern life possible and keep America moving and growing as they meet the needs of our nation and local communities, strengthen economic and national security, and support 2 million American jobs.

American Lamb Council | American Sheep Industry Association, Inc. www.sheepusa.org | American Wool Council

*** PRESS RELEASE * * PRESS RELEASE * * PRESS RELEASE ***

July 8, 2013

SHEEP INDUSTRY JOINS SEN. BARRASSO IN MOVE TO REPEAL RENEWABLE FUELS STANDARD

For More Information Contact:
Peter Orwick, 303-771-3500, ext. 33, or porwick@sheepusa.org

DENVER, Colo. – "The mandate on Renewable Fuels Standard (RFS), corn-based ethanol in particular, has had a devastating effect on the entire food economy from livestock producers facing record feed costs to consumers' balancing food budgets in tough economic times." declares American Sheep Industry Association (ASI) president and lamb producer, Clint Krebs.

Before the July 4th recess, U.S. Sens. John Barrasso (R-Wyo.), Mark Pryor (D-Ark.) and Pat Toomey (R-Penn.) introduced *The Renewable Fuel Standard Repeal Act* (S. 1195). The bill would repeal the RFS in its entirety. The bill was co-sponsored by nine additional senators.

This bipartisan legislation would eliminate the corn-based ethanol mandate currently required by the RFS, reduce the overall requirements of cellulosic ethanol not filled by other advanced biofuels and rescind the Environmental Protection Agency waivers allowing gasoline blends containing up to 15 percent of ethanol.

"The RFS is fundamentally broken and beyond repair," says Barrasso. "Instead of delivering meaningful environmental benefits, it's driven up food and fuel costs for American families. This flawed program will also inevitably lead to widespread lawsuits against American manufacturers. When Congress enacts bad policy, the right response is to scrap it and start over."

In 2005, Congress established the RFS effectively requiring refiners to blend increasing volumes of biofuels (e.g., corn ethanol) into the nation's gasoline supplies. In 2007, Congress expanded the RFS effectively requiring refiners to blend much larger volumes of biofuels and advanced biofuels (e.g., cellulosic ethanol) into the nation's gasoline and diesel fuel supplies.

"ASI policy supports Sen. Barrasso's goal to repeal this fuel standard. Sheep producers, along with all livestock operators feeding grain, are taking the financial hit from the RFS mandate," maintains Krebs. "There is concern among sheep producers about the influence renewable-energy policies have on the price of feed-grains, especially at a time when lamb prices are at an all-time low."

ASI is a national trade organization supported by 46 state sheep associations, benefiting the interests of more than 81,000 sheep producers.

# # #

NEWS

energy API

FOR IMMEDIATE RELEASE

Carlton Carroll | carrollc@api.org | 202.682.8114

API welcomes bipartisan Senate proposal to end unworkable biofuels mandate

WASHINGTON, June 20, 2013 – API President and CEO Jack Gerard welcomed the bipartisan proposal introduced in the U.S. Senate that would fully repeal the nation's unworkable biofuels mandate, known as the Renewable Fuel Standard (RFS).

"The ever increasing biofuels mandate is a looming national crisis," Gerard said. "Unless we put an immediate end to this outdated, detrimental policy, the mandate could put consumers in harm's way and disrupt the nation's fuel supply."

Gerard said the industry is hitting the ethanol blend wall, meaning the amount of ethanol required to be blended under the RFS is unsafe for most vehicles on the road today. Millions of cars could be severely damaged by fuel blends that contain more than 10 percent ethanol, according to studies by the Coordinating Research Council (here and here), and automakers have said higher ethanol blends would void car warranties.

The mandate could also cause severe fuel rationing, drive up the cost of diesel by 300 percent and the cost of gasoline by 30 percent by 2015, and lead to a $770 billion decrease in U.S. GDP and a $580 billion decrease in take-home pay for American workers, according to a study by NERA economic consulting.

"Ethanol and other renewable fuels have an important role to play in our transportation fuel mix and will continue to be used after Congress repeals the mandate," Gerard said. "But we cannot allow a mandate for ethanol that exceeds what is safe for automobiles and that could put upward pressure on fuel prices."

API thanked Senators John Barrasso (R-WY) and Senator Mark Pryor (D-AR) for leading efforts in the Senate to repeal the RFS and thanked co-sponsoring Senators Senator Pat Toomey (R-PA), Senator Saxby Chambliss (R-GA), Senator Ted Cruz (R-TX), Senator Mike Enzi (R-WY), Senator John Boozman (R-AR), and Senator Tim Scott (R-SC). A bipartisan proposal to end the RFS was introduced in the U.S. House of Representatives in April.

API is a national trade association that represents all segments of America's technology-driven oil and natural gas industry. Its more than 500 members – including large integrated companies, exploration and production, refining, marketing, pipeline, and marine businesses, and service and supply firms – provide most of the nation's energy. The industry also supports 9.2 million U.S. jobs and 7.7 percent of the U.S. economy, delivers $85 million a day in revenue to our government, and, since 2000, has invested over $2 trillion in U.S. capital projects to advance all forms of energy, including alternatives.

# # #

November 04, 2010

Clark: Foreign Oil Threatens America's National Security

Author: Growth Energy

WASHINGTON, DC – For a book published recently by the Center for Security Policy, Growth Energy Co-Chairman, Gen. Wesley K. Clark (Ret.), authored an essay arguing that our nation's addiction to foreign oil has led America into an expensive and bloody 30-year campaign to protect our access to oil in the Middle East.

Gen. Clark's essay, "The World According to Biofuels," argues that continuing to inject petro-dollars into regions hostile to U.S. interests is costing America dearly in both blood and treasure. He argues that America has the capacity to produce enough ethanol today to break the hold oil – and thereby oil-exporting interests, such as the cartel OPEC – has over the United States.

After the OPEC-driven oil crisis of the 1970s, Gen. Clark writes, the U.S. responded by creating the Rapid Deployment Joint Task Force. That task force evolved into the U.S. Central Command, which oversees military operations today in Iraq and Afghanistan, and the formation of the U.S. Fifth Fleet, which provides military escort to oil-shipping tankers out of the Gulf. America's dependence on foreign oil has cost the nation more than $7 trillion over that time, Gen. Clark writes.

However, it doesn't have to be that way. Ethanol is a viable alternative to oil, and is available today. Grain and cellulosic ethanol "could be used all over the world to help make developing nations energy independent -- breaking the yoke of strongmen, rogue nations and cartel-driven energy prices not just on our economy, but on the economies of those nations that are most vulnerable," Clark writes.

The Center for Security Policy's recently published anthology Homegrown Defense: Biofuels and National Security is a collection of essays by eminent energy security experts on the role that biofuels can and must play in reducing America's dependence on oil and the hostile nations that monopolize its production globally. The book explores biofuels as an alternative to the status quo, characterized by key oil-producing nations selectively cutting production to raise prices worldwide, and using the revenues to support terrorism, weapons proliferation, and other threats to international stability.

"We are grateful to Gen. Wesley Clark for his important contribution to this volume. In light of Gen. Clark's previous service to our nation as NATO Supreme Allied Commander, his insights on the viability of biofuels and the advantages they offer from a national security perspective constitute a critical part of this work," said Frank J. Gaffney, Jr., President and CEO of the Center for Security Policy.

Homegrown Defense is available for purchase at Amazon.com.

###

About Growth Energy
Growth Energy is a group committed to the promise of agriculture and growing America's economy through cleaner, greener energy. Growth Energy members recognize America needs a new ethanol approach. Through smart policy reform and a proactive grassroots campaign, Growth Energy promotes reducing greenhouse gas emissions, expanding the use of ethanol in gasoline, decreasing our dependence on foreign oil, and creating American jobs at home. More information can be found at GrowthEnergy.org.

- See more at: http://www.growthenergy.org/news-media/press-releases/clark-foreign-oil-threatens-americas-national-security/#sthash.ondk46Pg.dpuf

NEWS RELEASE

National Cattlem
Beef Association
Cattlemen • Leadership • So

FOR IMMEDIATE RELEASE

Contacts: Chase Adams
202-879-9117
cadams@beef.org

Cristina Llorens
202-879-9138
cllorens@beef.org

Livestock and Poultry Groups Urge Congress to Repeal the Renewable Fuel Standard

WASHINGTON (June 27, 2013) – Following an announcement by Sens. John Barrasso (R-Wyo.), Mark Pryor (D-Ark.) and Pat Toomey (R-Pa.) that they have introduced the bi-partisan Renewable Fuels Standard Repeal Act (S. 1195), the National Cattlemen's Beef Association (NCBA), National Chicken Council (NCC) and the National Turkey Federation (NTF) urge Congress to repeal the Renewable Fuels Standard (RFS).

"The RFS has been such a poorly managed mess, it's time to drain the swamp," said NTF President Joel Brandenberger. "The RFS needs a fresh start in order to put in place a smarter policy on the mix of fuel and feed."

The RFS last year required 13.2 billion gallons of corn-based ethanol to be blended into gasoline; it mandates that 13.9 billion gallons be blended in 2013, an amount that will use about 4.9 billion bushels of corn, or about 40 percent of the nation's crop.

"Chicken producers are already competing with the weather," said NCC President Mike Brown. "Why must we also compete with an inflexible federal mandate that voluntarily places another strain on our limited resources? I commend Sens. Barrasso, Pryor and Toomey for taking an approach that would let the free market decide whether corn should go to food or to fuel."

Livestock and poultry groups called on the administration last fall to waive the RFS for the second time since 2008. And for the second time, in spite of the widespread drought and lowered harvest, the U.S. Environmental Protection Agency (EPA) refused to use the safety valve built into the biofuels mandate.

"Cattlemen and women are self-reliant, but in order to maintain that we cannot be asked to compete with federal mandates like the Renewable Fuels Standard for the limited supply of feed grains," said NCBA Policy Vice Chair Craig Uden, an Elwood, Neb., cattle feeder. "When EPA is unable to provide even a temporary waiver of the RFS during the worst drought in 50 years, it is apparent the RFS is broken and we appreciate the efforts of Sens. Barrasso, Pryor and Toomey to fix this flawed program."

NCBA, NCC and NTF call on Congress to repeal the RFS to ensure market stability certainty for rural American economies.

###

The National Cattlemen's Beef Association (NCBA) has represented America's cattle producers since 1898, preserving the heritage and strength of the industry through education and public policy. As the largest association of cattle producers, NCBA works to create new markets and increase demand for beef. Efforts are made possible through membership contributions. To join, contact NCBA at 1-866-BEEF-USA or [illegible]@beef.org.

© Copyright 2013 National Cattlemen's Beef Association, all rights reserved

Livestock and Poultry Groups Urge Congress to Repeal the Renewable Fuel Standard

WASHINGTON (June 26, 2013) – Following an announcement by Sens. John Barrasso (R-Wyo.), Mark Pryor (D-Ark.) and Pat Toomey (R-Pa.) that they have introduced the bi-partisan Renewable Fuels Standard Repeal Act, (S. 1195) the National Cattlemen's Beef Association (NCBA), National Chicken Council (NCC) and the National Turkey Federation (NTF) urge Congress to repeal the Renewable Fuels Standard (RFS).

"RFS has been such a poorly managed mess, it's time to drain the swamp," said NTF President Joel Brandenberger. "The RFS needs a fresh start in order to put in place a smarter policy on the mix of fuel and feed."

The RFS last year required 13.2 billion gallons of corn-based ethanol to be blended into gasoline; it mandates that 13.9 billion gallons be blended in 2013, an amount that will use about 4.9 billion bushels of corn, or about 40 percent of the nation's crop.

"Chicken producers are already competing with the weather," said NCC President Mike Brown. "Why must we also compete with an inflexible federal mandate that voluntarily places another strain on our limited resources? I commend Sens. Barrasso, Pryor and Toomey for taking an approach that would let the free market decide whether corn should go to food or to fuel."

Livestock and poultry groups called on the administration last fall to waive the RFS, for the second time since 2008. And for the second time, in spite of the widespread drought and lowered harvest, the U.S. Environmental Protection Agency (EPA) refused to use the safety valve built into the biofuels mandate.

"Cattlemen and women are self-reliant, but in order to maintain that we cannot be asked to compete with federal mandates like the Renewable Fuels Standard for the limited supply of feed grains," said NCBA Policy Vice Chair Craig Uden, an Elwood, Neb., cattle feeder. "When EPA is unable to provide even a temporary waiver of the RFS during the worst drought in 50 years, it is apparent the RFS is broken and we appreciate the efforts of Senators Barrasso, Pryor and Toomey to fix this flawed program."

NCBA, NCC and NTF call on Congress to repeal the RFS to ensure market stability certainty for rural American economies.

###

Press Release

Tom Super
tsuper@chickenusa.org
202.443.4130

NATIONAL CHICKEN COUNCIL

Livestock and Poultry Groups Urge Congress to Repeal the Renewable Fuel Standard

WASHINGTON, D.C. – June 27, 2013 – Following an announcement by Sens. John Barrasso (R-Wyo.), Mark Pryor (D-Ark.) and Pat Toomey (R-Pa.) that they have introduced the bipartisan Renewable Fuels Standard Repeal Act, (S. 1195) the National Cattlemen's Beef Association (NCBA), National Chicken Council (NCC) and the National Turkey Federation (NTF) urge Congress to repeal the Renewable Fuels Standard (RFS).

"Chicken producers are already competing with the weather," said NCC President Mike Brown. "Why must we also compete with an inflexible federal mandate that voluntarily places another strain on our limited resources? I commend Sens. Barrasso, Pryor and Toomey for taking an approach that would let the free market decide whether corn should go to food or to fuel."

The RFS last year required 13.2 billion gallons of corn-based ethanol to be blended into gasoline; it mandates that 13.9 billion gallons be blended in 2013, an amount that will use about 4.9 billion bushels of corn, or about 40 percent of the nation's crop.

"RFS has been such a poorly managed mess, it's time to drain the swamp," said NTF President Joel Brandenberger. "The RFS needs a fresh start in order to put in place a smarter policy on the mix of fuel and feed."

Livestock and poultry groups called on the administration last fall to waive the RFS, for the second time since 2008. And for the second time, in spite of the widespread drought and lowered harvest, the U.S. Environmental Protection Agency (EPA) refused to use the safety valve built into the biofuels mandate.

"Cattlemen and women are self-reliant, but in order to maintain that we cannot be asked to compete with federal mandates like the Renewable Fuels Standard for the limited supply of feed grains," said NCBA Policy Vice Chair Craig Uden, an Elwood, Neb., cattle feeder. "When EPA is unable to provide even a temporary waiver of the RFS during the worst drought in 50 years, it is apparent the RFS is broken and we appreciate the efforts of Senators Barrasso, Pryor and Toomey to fix this flawed program."

NCBA, NCC and NTF call on Congress to repeal the RFS to ensure market stability certainty for rural American economies.

###

nccr
NEWS RELEASE
Liberty Place, 325 7th Street, NW, Suite 1100, Washington, DC 20004
800.NRF.HOW2 (800-673-4692) fax 202-737-2849 www.nccr.net

For Immediate Release
Stephen E. Schatz (202) 626-8119
SchatzS@NCCR.net

National Council of Chain Restaurants Lauds Senate RFS Repeal Bill

WASHINGTON, June 21, 2013 - The National Council of Chain Restaurants today issued the following statement from Executive Director Rob Green on the introduction of the Renewable Fuel Standard Repeal Act (S.1195), which seeks to repeal the costly and controversial federal biofuels law that has been shown to raise food costs.

"The National Council of Chain Restaurants and our broad membership of quick-service, fast casual and table service restaurants support the full repeal of the federal Renewable Fuel Standard (RFS). As long as the mandate is law, it will continue to adversely affect America's chain restaurants, their small business owners, operators and franchisees, and their customers.

"NCCR applauds Senators John Barrasso, R-Wy., Mark Pryor, D-Ar. and Pat Toomey, R-Pa. for introducing this bipartisan piece of legislation aimed at repealing the ethanol mandate, a flawed federal policy that has had numerous unintended consequences. The bill is yet more evidence of the growing consensus that the RFS is bad public policy and should be repealed before it does any more damage to the economy."

A recent PwC study found that the federal mandate on corn-based ethanol substantially raised costs for chain restaurants on a wide variety of food commodities to the tune of $3.2 billion a year. NCCR launched a coalition-based grassroots campaign – "Feed Food Fairness: Take RFS Off the Menu" – to highlight the negative consequences of the federal mandate and to advocate for RFS repeal.

###

The National Council of Chain Restaurants (NCCR) is the leading trade association exclusively representing chain restaurant companies. For more than 40 years, NCCR has worked to advance sound public policy that best serves the interests of restaurant businesses and the millions of people they employ. NCCR members include the

country's most-respected quick-service and table-service chains. NCCR is a division of the National Retail Federation, the world's largest retail trade group.

Wyoming Petroleum Marketers Support Barrasso Bill Repealing Renewable Fuel Standard

FOR IMMEDIATE RELEASE - Contact Mark Larson, WPMA Executive Director, (307) 632-1516

Cheyenne WY – The Wyoming Petroleum Marketers Association (WPMA) today announced their support for S.1195 by U.S. Senators John Barrasso (R-WY), Mark Pryor (D-AR) and Pat Toomey (R-PA), "The Renewable Fuel Standard Repeal Act." The bill would repeal the Renewable Fuel Standard (RFS) in its entirety.

WPMA traveled to Washington DC to discuss how the Renewable Fuel Standard (RFS) is fundamentally broken and beyond repair. WPMA is a trade association comprised of petroleum marketers and distributors downstream of the refineries and terminal racks. WPMA Chairman Don Policky, Big D Oil, agreed completely with Senator Barrasso's statement, "Instead of delivering meaningful environmental benefits, it's driven up food and fuel costs for American families." Policky added that the Environmental Protection Agency (EPA) has had the authority to adjust the Standard to reflect current volumes but has refused to do so. "It is simply irresponsibly to continue a mandate that is not achievable given today's market, while at the same time exposing petroleum marketers and manufactures to widespread lawsuits and penalties." Policky agrees with Barrasso's comment, "When Congress enacts bad policy, the right response is to scrap it and start over."

In 2005, Congress established the RFS effectively requiring refiners to blend increasing volumes of biofuels (e.g., corn ethanol) into the nation's gasoline supplies. In 2007, Congress expanded the RFS effectively requiring refiners to blend much larger volumes of biofuels and advanced biofuels (e.g., cellulosic ethanol) into the nation's gasoline and diesel fuel supplies. This year, the nation is expected to consume approximately 133 billion gallons of gasoline. It is likely refiners will hit the ethanol "blend wall" this year, meaning that the RFS can only be achieved by blending larger and larger amounts of ethanol like the EPA approved E-15. Currently, E-15 poses significant risk for gasoline retailers.

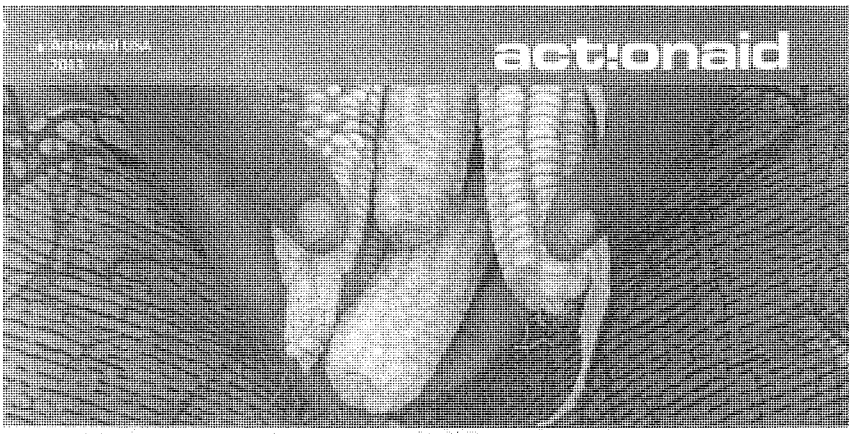
WPMA points out that several federal regulations, state laws, local ordinances and insurance policies require UL (Underwriters Laboratories) certified equipment. UL has not certified existing dispensers, piping or underground storage tanks for selling E-15. Retailers who decide to sell E-15 could be held liable to pay for cleanup costs if a leak occurs due to the increased ethanol blends, and insurance companies may deny coverage. Importantly, the EPA has authorized E-15 only in certain post-2001 vehicles. Consumers often do not know the manufacture year of their vehicles so misfueling with E-15 may cause damage to many pre-2001 vehicles if utilized. The EPA can charge up to $37,000 per day per violation for utilizing non-certified equipment or allowing fuel to be sold into unauthorized vehicles. Add to the above those engines specifically prohibiting the use of ANY ethanol blends whatsoever (lawn mowers, snowmobiles, boat motors, etc.) and you have a recipe for litigation and law suits.

"Clearly, the EPA did not think this through." said Policky, "Pushing for blends that ignore certification thresholds, thus placing petroleum retailers and

consumers at risk, smacks of an agenda that was not well vetted." Policky also agrees with Sen. Barrasso's statements on the impact these mandates are having on food prices and livestock feed prices. Policky further states that some of the mandated ethanol is derived from unproven technology and that those mandated volumes are impossible to achieve, such as the cellulosic biofuels mandate. "Yet the EPA continues to maintain these Standards as obtainable, thus completely ignoring the facts. It is time for congress to repeal this boondoggle program.", said Policky.

Finally and importantly, the RFS has contributed to higher transportation fuel prices for American motorists. Since early January, the spot prices for Renewable Identification Numbers (RINs) have increased more than 1000 percent or tenfold. Under the RFS, refiners or blenders must obtain RINs to demonstrate to EPA the volume of biofuels blended into the nation's gasoline and diesel fuel supplies. As refiners and blenders spend more money for RINs, this cost is passed on to consumers in the form of higher gasoline and diesel fuel prices. "RINs are an artificially created government mechanism for tracking renewable fuels. Their only value is derived when government mandates cannot be achieved in a normal marketplace." said Association Executive Director Mark Larson. "We are extremely appreciative of Sen. Barrasso's efforts at repealing this unobtainable and financially burdensome program that is targeting American consumers unnecessarily."

Contact Mark Larson at (307) 632-1516 or mlarson@cwpma.org.



Esperança Sinela's Maize crop, Mozambique. Photo credit: Gisele Wulfsohn/Panos/ActionAid

BIOFUELS, FOOD SECURITY AND LAND GRABS

INTRODUCTION

The unsustainable expansion of biofuels production around the world is one of the primary contributors to higher and more volatile food prices. The US Renewable Fuel Standard (RFS) has played a key part in this, mandating a growing amount of biofuels to be blended into the US fuel supply. Without decisive action on the part of the US to eliminate its mandates for land-intensive biofuels from corn, sugar, and soy, this trend will continue, with poor people in developing countries bearing the brunt of the burden.

BIOFUELS: A FALSE SOLUTION

When the Renewable Fuel Standard (RFS) was written, the idea was to create a renewable source of fuel at home. Unfortunately this legislation turned out to be dangerously short-sighted. Not only is corn the foundation of the US food system, but the US is also the world's largest corn exporter. This means that policies placing an additional, inflexible demand on the US corn harvest make supply tighter and the international price more volatile, leading to price shocks and increased food insecurity. The prices of other cereal staples are impacted too as, for example, when wheat is used as a substitute for high-priced corn, raising the demand and the price for wheat.

Biofuel Mandates in a Hungry World

When the RFS mandated that corn be used for fuel, it ignored several harmful consequences:

1. Linking food and fuel prices. [illegible] for food is artificially linked to the price of oil. The more oil is worth, the more demand for corn [illegible] for corn.
2. Diverting food and feed to fuel. [illegible] mandates for food-based biofuels, corn and other crops that were used to feed people and animals [illegible] the food supply. [illegible] the percentage of the corn harvest used for ethanol has increased from [illegible].
3. Changing climate. As the climate changes, different weather events happen more frequently. [illegible] severe drought or other [illegible] crops, it decreases the supply and increases the price. At the same time, increased [illegible] corresponds with [illegible] percentage of the corn harvest [illegible] prices to all-time highs.

Ever-increasing demand for biofuels produced from corn, sugar, and soy have contributed significantly to the expansion of industrial agriculture in the US and around the world. Since it was expanded in 2007, the corn ethanol mandate has contributed to plowing up more than 23 million acres of US wetlands and grasslands to plant crops -- an area the size of Indiana. Internationally, the expanding production of biofuel feedstocks in places like Guatemala has made it

much harder for small-scale food producers to access land to feed themselves and their communities.

HOW DOES THIS AFFECT PEOPLE LIVING IN POVERTY?

1. **Increased food insecurity:** People living in poverty typically spend between 60-80% of their income on food. When prices increase, even just a little, families are forced to make tough choices. Evidence shows, for example, that almost 65% of poor households in Uganda have responded to soaring food prices by reducing food consumption and dietary diversity.

2. **Cost to developing countries:** US corn ethanol mandates cost developing countries $6.6 billion from 2006 - 11. For Guatemala the additional cost of importing corn was $28 million for the trade year 2010-2011 alone -- an amount equivalent to US food assistance to Guatemala over the same period. This means that the US is essentially cancelling out its foreign assistance investments in a country where half the population falls below the poverty line and half of all children under the age of 5 suffer from chronic malnutrition.

3. **A fight for land:** Due to the runaway expansion in biofuels production, people around the world are finding that the land that they use to grow food and feed their families is becoming more valuable. In some cases this has led to land grabs. In others, it has meant a shortage of available land for small-scale food production. From Guatemala to Tanzania, smallholder farmers have been removed from their land to facilitate the production of biofuel feedstocks.

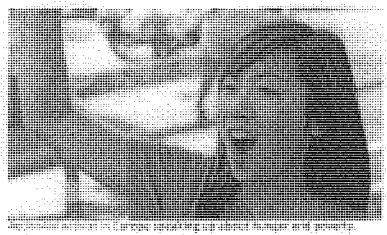


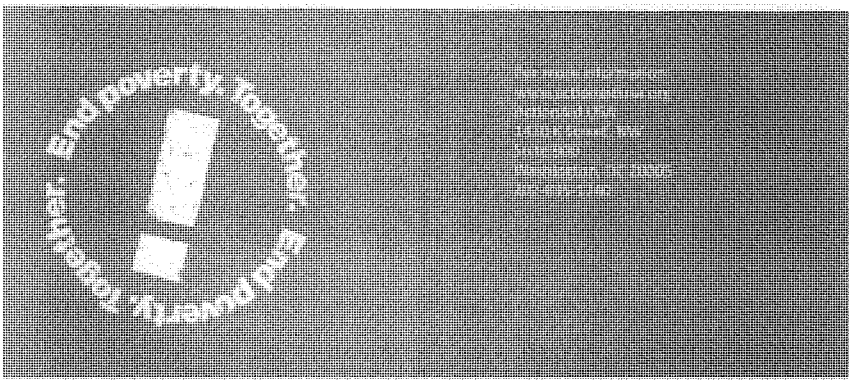
Photo credit: Christophe Hebting/ActionAid

WHAT CAN YOU DO?

1. Tell your Representative and Senators to eliminate US mandates for food-based biofuels to alleviate the impact of biofuels on food security and land rights. Sign 3 copies of the Food not Fuel postcards – one for each Senator and one for your Representative – and return them to ActionAid for delivery at a key moment. Call the offices of your Representative and Senators or gather a group of friends to visit their district office.

2. Spread the word: Now tell your friends and get them to take action too!

For more information please visit www.actionaidusa.org/what-we-do/land-rights-and-biofuels



Financial Times
August 10, 2012

COMMENT

# of banking's insatiable greed

ions, in short, is let the devil
e hindmost.
ne level, the worry is about
llenge to the legitimacy of
ism. It is hard for people to
historically high levels of
dity in difficult times when
n no longer perceive any
ink between effort and reward
op. If those at the top are
received to be devoid of moral
le in their pursuit of profit, the

**e is a risk that the
latory response to
dals could lead to
ragmentation of the
al financial system**

ge is dangerously multiplied.
nother level, this all re-
ises a fundamental problem
ancial crisis that started
five years ago. While finance
l, financial regulation is
dly national. Yet there is a
g risk that the regulatory
se to scandals could, as a
uct, lead to the fragmentation
global financial system. If Standard Chartered and others were to lose banking licences in New York, for example, financial deglobalisation would unquestionably accelerate.

It is easy to underestimate how far the shift to a home country bias in finance has gone already. To take just one example, Morgan Stanley estimates that the eurozone banks' contribution to big ticket trade finance in Asia fell from 18 per cent to 3 per cent in the 18 months to June this year.

In effect, regulators are increasing firewalls and seeking to trap more capital and liquidity at home, especially in the eurozone, which lacks a lender of last resort facility for cross-border institutions. Eurozone banks have also been reorganising business on a country by country basis to reduce the risk that their liabilities might be redenominated in another currency if the eurozone fragments.

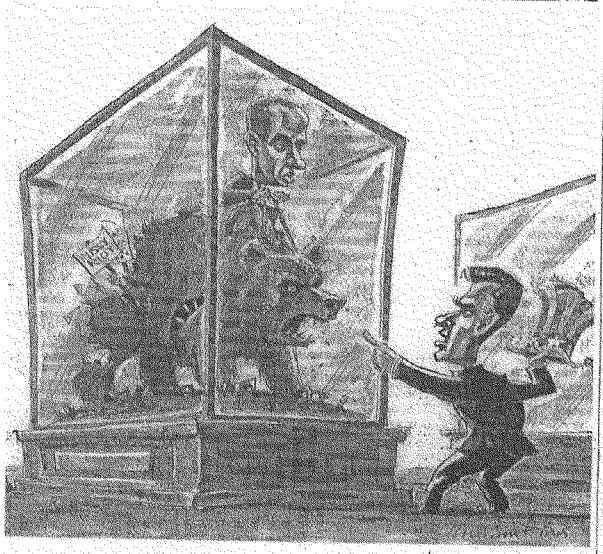
While the European Central Bank has managed to ease funding pressures since December, a trend for banks to match assets and liabilities on a country basis remains intact.

There is a natural, populist temptation to rejoice in the notion that over-mighty financial institutions are being cut down to size and deprived of their global *laisser passer*. Yet there are costs. Mark Carney, governor of the Bank of Canada and chairman of the Financial Stability Board, which coordinates global financial regulation, warned the G20 summit in June that when mutual confidence is lost, retreat from an open and integrated financial world into a nationally segmented system could rapidly reduce both financial capacity and systemic resilience, at high cost to jobs and growth.

The one risk that can be overestimated in all this is of a battle to bolster New York's financial business at London's expense. In the 1950s and 1960s tough regulation and restrictive taxes in the US drove financial business to London. Excessive zeal in US regulation and law enforcement today could have much the same effect.

Yet competition between financial centres is a trivial issue when compared with the wider global threat to jobs and growth. The stakes in this unfolding saga are uncomfortably high.

john.plender@ft.com



choosing a Moscow cathedral to lampoon Mr Putin. But their trial for "hooliganism incited by racial hatred" has said more about the mindset of the Russian president than about the alleged transgression.

Like many autocrats, including those who have been toppled in the Middle East, Mr Putin underestimates the importance of legitimacy. When he elbowed aside the more liberal-leaning Dmitry Medvedev to return to the Olympic medals.

The west should not take comfort in any of this. Its interest lies in a Russia prosperous and confident enough to see a role for itself on the international stage beyond propping up nasty dictators such as Mr Assad. There are plenty of people in Russia who see the benefits of political liberalisation at home and engagement abroad.

The sensible approach for the west is to be as robust as necessary when

The US must halt biofuel production to prevent a food crisis

José Graziano da Silva

The worst drought for 50 years is inflicting huge damage on the US maize crop, with serious consequences for the overall international food supply.

The situation reminds us that even the most advanced agricultural systems are subject to the vagaries of the weather, leading to volatility in supplies and prices not just on domestic markets but also internationally. Climate change and extreme weather events will further complicate the picture.

US maize production had been expected to increase to record levels this year. That view will prove optimistic. Much of the reduced crop will be claimed by biofuel production in line with US federal mandates, leaving even less for food and feed markets. The August US Department of Agriculture estimates, announced today, will give a more precise idea for just how much the maize crop is reduced. Few people are expecting good news.

Maize prices have already gone higher than their 2008 and 2011 peaks, increasing by 25 per cent during July alone. Wheat prices have followed maize prices upwards. Repercussions are already being felt in the US livestock sector.

Unsurprisingly, the media has started talking about the possibility of a food crisis. Whether that happens depends not only on how long the drought lasts and how much damage it does to crops but also on how far its impact spreads to other markets, whether there are further supply shocks and how countries react to price movements.

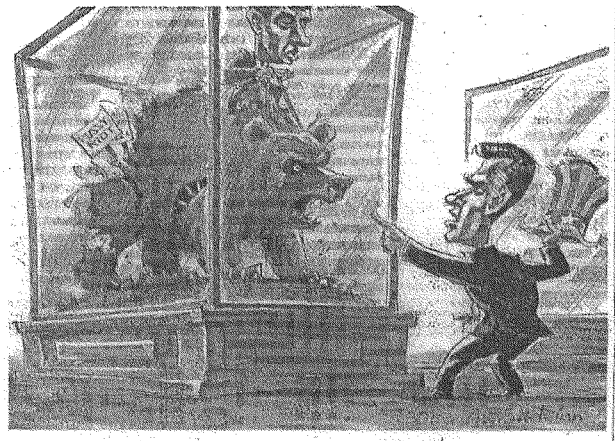
In 2007-08 governments tended to react in a disorganised and erratic manner, which often accentuated global price rises, as was the case with the imposition of export

Biofuel production has reached 15.2bn gallons, which meant using the equivalent of 121.9m tonnes of maize

restraints. Often the measures were not even effective in meeting the objective of stabilising domestic prices, as they often led to panic buying and hoarding.

Given all this, governments should be cautious, especially considering that high prices are not necessarily negative. Attractive producer prices will be needed in the coming months to entice producers to embark on a much needed increase of crop cultivation, especially in the southern hemisphere.

Some governments will be called to take a number of steps to alleviate the impact of the situation on the poorest consumers, for example through the targeted distribution of food at subsidised prices, increased



choosing a Moscow cathedral to lampoon Mr Putin. But their trial for "hooliganism incited by racial hatred" has said more about the mindset of the Russian president than about the alleged transgression.

Like many autocrats, including those who have been toppled in the Middle East, Mr Putin underestimates the importance of legitimacy. When he elbowed aside the more liberal-leaning Dmitry Medvedev to return to the presidency, Mr Putin imagined 12 trouble-free years in the Kremlin. That hope has dissolved. Neither supporters of Mr Medvedev nor opposition leaders have the strength to overturn him, but the protests have undermined him, especially among a Muscovite middle class increasingly frustrated by the regime's corruption.

Mr Putin still has revenues from oil and gas, but the economic tides are increasingly running against him. As anyone living in London can tell you, capital flight continues apace.

The absence of the rule of law leaves foreign investors increasingly wary, demanding ever higher risk premiums for projects in Russia.

The country's infrastructure is rotting and its population falling fast. It has forgotten how to build space rockets and how to win Olympic medals.

The west should not take comfort in any of this. Its interest lies in a Russia prosperous and confident enough to see a role for itself on the international stage beyond propping up nasty dictators such as Mr Assad. There are plenty of people in Russia who see the benefits of political liberalisation at home and engagement abroad.

The sensible approach for the west is to be as robust as necessary when necessary and to engage where possible. To demonise Mr Putin, as Mr Romney suggests, is to lend credibility to the Russian president's warped conspiracy theories and his efforts to snuff out opposition at home. There are areas where the US and Russia can and should co-operate. Iran is one, Afghanistan another. Efforts to further reduce the US and Russian nuclear arsenals are vital to the broader goal of sustaining an international non-proliferation regime.

Co-operation does not assume support for the Kremlin's repression or ignoring the nature of the regime. Rather it is to acknowledge that change belongs to Russians. Mr Putin will not let go of the past, but he will discover sooner or later there is no future in it.

philip.stephens@ft.com

COMMENT ON FT.COM

The British economy has begun to head down a perilous path, writes **Gavyn Davies**

www.ft.com/comment

e US to
rate
iot
ie
rt
a
in's
sion

suming avian flu research

alls into this category. In the re scenario whereby a H5N1 virus escapes from and causes a pandemic, e involved – and the life in general – will be blamed. ecomes "legitimate" to a deadly virus we will see an n in this type of research. re many more avian than influenza viruses. If this rsial work is allowed to and more labs are going to ved, the risk of an accidental f a mutated H5N1 virus s exponentially. nts do happen. We need look er than the re-emergence 1N1 virus in 1977, after a 20-

ore we know, the r we can block mission. But it is a y to consider every iment fair game

year hiatus. A group of US scientists investigating the 1977 outbreak concluded that it leaked out of a Russian lab that was working on a live-attenuated H1N1 virus vaccine.

Historical data are not encouraging, either. Between 1978 and 1999 there were more than 1,200 incidents in which people were infected from BSL-4 labs. Since 1999, lab workers have been killed by numerous microbes, including Ebola and the Sars respiratory virus.

Scientists have a moral responsibility to speak up and question the fundamental wisdom, the ethics and the social advisability of conducting such research. This includes questioning the scientific rationale for research of "dual-use concern", even if that means taking on the powers that be or making themselves unpopular.

The moratorium on H5N1 research at the centre of the controversy should remain in place indefinitely until the international scientific community has had time to discuss whether this is responsible science. We are of the opinion that this is irresponsible research that should never have been undertaken and should not be resumed.

If it is considered vitally important, internationally agreed guidelines for such research should be put in place and a consensus developed as to the conditions under which the research could be allowed to resume. In the meantime, there needs to be a wider, truly international discussion with experts from all fields of the life sciences, as well as public involvement, on the scientific, social and ethical advisability of pursuing biomedical research that aims to create potentially deadly agents – and on the consequences of succeeding.

Peter Hale is the founder of the Foundation for Vaccine Research, Washington, DC. Simon Wain-Hobson is a professor in the Department of Molecular Retrovirology, Institut Pasteur, Paris. Robert May is a professor in the, Department of Zoology, Oxford university

repercussions are already being felt in the US livestock sector.

Unsurprisingly, the media has started talking about the possibility of a food crisis. Whether that happens depends not only on how long the drought lasts and how much damage it does to crops but also on how far its impact spreads to other markets, whether there are further supply shocks and how countries react to price movements.

In 2007-08 governments tended to react in a disorganised and erratic manner, which often accentuated global price rises, as was the case with the imposition of export

Biofuel production has reached 15.2bn gallons, which meant using the equivalent of 121.9m tonnes of maize

restraints. Often the measures were not even effective in meeting the objective of stabilising domestic prices, as they often led to panic buying and hoarding.

Given all this, governments should be cautious, especially considering that high prices are not necessarily negative. Attractive producer prices will be needed in the coming months to entice producers to embark on a much needed increase of crop cultivation, especially in the southern hemisphere.

Some governments will be called to take a number of steps to alleviate the impact of the situation on the poorest consumers, for example through the targeted distribution of food at subsidised prices, increased reliance on non-commodities crops such as roots, tubers, and beans, and assisting small producers to get better seeds and other basic inputs. Over the longer term, strategies to increase local production and self-sufficiency should be implemented.

Fortunately rice supplies in 2012 are plentiful and rice prices stable, but they could also be driven higher by increasing prices of other cereals. Rice market stocks were also not problematic in 2007-08 but prices nevertheless increased dramatically. A lack of transparency and uncoordinated unilateral actions by importing and exporting countries and media coverage all contributed to creating panic.

With world prices of cereals rising, the competition between the food, feed and fuel sectors for crops such as maize, sugar and oilseeds is likely to intensify. One way to alleviate some of the tension would be to lower or temporarily suspend the mandates on biofuels. At the moment, the renewable energy production in the US is reported to have reached 15.2bn gallons in 2012, for which it used the equivalent of some 121.9m tonnes or about 40 per cent of US maize production. An immediate, temporary suspension of that mandate would give some respite to the market and allow more of the crop to be channelled towards food and feed uses.

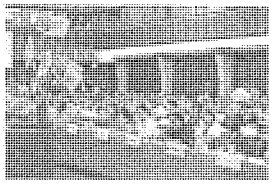
The US drought leaves global markets highly vulnerable to any further supply side shocks. While the current situation is precarious and could deteriorate further if unfavourable weather conditions persist, it is not a crisis yet. Countries and the UN are better equipped than in 2007-08 to face high food prices, with the introduction of its Agricultural Market Information System, which promotes co-ordination of policy responses.

However, risks are high and the wrong responses to the current situation could create them. It is vitally important that any unilateral policy reactions from countries, whether importers or exporters, do not further destabilise the situation.

The writer is the director-general of the Food and Agricultural Organization of the UN

Biofuel development should not compromise food security, says CFS

Committee on World Food Security also stresses policy and investment support for smallholder farmers and producers



The Committee on World Food Security promotes better policy convergence for food security.

11 October 2013, Rome - Following a week of intense discussions, the Committee on World Food Security stressed the link between biofuels and food security, saying that the "progressive realization of the right to adequate food for all" should be a priority concern in biofuel development.

The world's most important intergovernmental and multi-stakeholder platform for food security and nutrition said biofuel development "should not compromise food security, and should especially consider women and smallholders."

The 7-11 October meeting drew nearly 750 people, including over 130 government delegations, 100 civil society and 50 private sector organizations. Following the talks, the CFS also agreed on the importance of integrating smallholder agriculture into national policies, strategies, and research aimed at boosting investment and sustainable development.

Family farmers, fishers and others whose livelihoods depend on smallholder agriculture in developing countries account for most of the 840 million chronically hungry people in the world, according to the recent UN hunger report, the *State of Food Insecurity in the World*.

Opportunities and risks

On the subject of biofuels and food security, informed by a report from the High Level Panel of Experts (HLPE) on Food Security and Nutrition, the CFS noted that biofuel development encompassed "both opportunities and risks in economic, social and environmental aspects," depending on the context and practices. "In some cases, current biofuel production creates competition between biofuel crops and food crops," it added.

The CFS encouraged FAO and other stakeholders to look at ways to help countries strengthen their capacities to assess their situation with regards to biofuels, taking into account food security concerns at global, regional and national levels, and legitimate land tenure rights.

"Governments and other appropriate stakeholders are encouraged to review biofuels policies - where applicable and if necessary - according to balanced science-based assessments of the opportunities and risks they may present for food security," the Committee said.

It called on biofuel research and development partners to improve the efficiency of biofuels regarding both resources and processes, and to devise solutions adapted to the needs of all stakeholders, including those in least-developed countries, as well as women and smallholders who are most in need of access to modern energy services.

The CFS' recommendation called on research and development partners to adapt biofuel production and processing to modulate the supply chain between food, feed and energy, depending on conditions.

The CFS specified that guidance on the issue is included in existing international agreements and instruments including: the CFS Global Strategic Framework for Food Security and Nutrition (GSF); the Voluntary Guidelines on the Responsible Governance of Tenure of Land, Fisheries and Forests in The Context of National Food Security (VGGT); the Voluntary Guidelines to support the progressive realization of the right to adequate food in the context of national food security; the Global Bioenergy Partnership (GBEP) Sustainability Indicators for Bioenergy and FAO Bioenergy and Food Security (BEFS) Approach.

Investment in smallholders

Video

Interview with Gerda Verburg, incoming CFS Chair and Netherlands Ambassador to the UN agencies in Rome

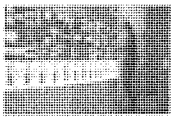
Audio

Interview with Gerda Verburg, incoming CFS Chair and Netherlands Ambassador to the UN agencies in Rome

Audio

Interview with Néstor Osorio, President of the UN's Economic and Social Council (ECOSOC)

Photo gallery



Images from CFS 40

Related links

Committee on World Food Security

State of Food Insecurity in the World

FAO Director-General's statement at CFS 40

#cfs40

On the issue of investment in smallholder agriculture, also informed by an HLPE report, the CFS adopted a policy recommendation calling on governments, together with smallholder organizations, civil society, the private sector, research institutions and international development partners, to work together to "build a country-owned vision" designed to boost investments in smallholder agriculture.

The CFS recommended countries consider how agricultural, urban and rural sector policies, strategies and budgets could best enable smallholder access to productive assets, local, national and regional markets, appropriate training, research, technology and farm support services - especially for women.

The importance of smallholder agriculture will be highlighted in 2014 during the International Year of Family Farming.

The CFS also tackled a wide range of other issues designed to support efforts to eradicate chronic hunger and extreme poverty, including responsible agricultural investments and food security in protracted crisis situations. These discussions were slated to continue during regional consultations in the months to come.

At the end of the week, Gerda Verburg of the Netherlands was elected as the CFS Chair for a two-year term. Verburg suceeds Yaya Olaniran of Nigeria.

GENetwork 9h
@GenEngNetwork
NL: UN Committee on World Food Security: Investing inSmallholder Agriculture and Agrofuels: bit.ly/1t6l7juU
/via@GMWatch

ileia 23h
ileia @ileia_NL
UN Committee on World Food Security: Investing in Smallholder Agriculture and

Compose new Tweet...

Contact

Charmaine Wilkerson
Media Relations (Rome)
(+39) 06 570 56302
charmaine.wilkerson@fao.org

© FAO, 2013

PNAS

Recent land use change in the Western Corn Belt threatens grasslands and wetlands

Christopher K. Wright[1] and Michael C. Wimberly

Geographic Information Science Center of Excellence, South Dakota State University, Brookings, SD 57007

Edited by B. L. Turner, Arizona State University, Tempe, AZ, and approved January 17, 2013 (received for review September 5, 2012)

In the US Corn Belt, a recent doubling in commodity prices has created incentives for landowners to convert grassland to corn and soybean cropping. Here, we use land cover data from the National Agricultural Statistics Service Cropland Data Layer to assess grassland conversion from 2006 to 2011 in the Western Corn Belt (WCB): five states including North Dakota, South Dakota, Nebraska, Minnesota, and Iowa. Our analysis identifies areas with elevated rates of grass-to-corn/soy conversion (1.0–5.4% annually). Across the WCB, we found a net decline in grass-dominated land cover totaling nearly 530,000 ha. With respect to agronomic attributes of lands undergoing grassland conversion, corn/soy production is expanding onto marginal lands characterized by high erosion risk and vulnerability to drought. Grassland conversion is also concentrated in close proximity to wetlands, posing a threat to waterfowl breeding in the Prairie Pothole Region. Longer-term land cover trends from North Dakota and Iowa indicate that recent grassland conversion represents a persistent shift in land use rather than short-term variability in crop rotation patterns. Our results show that the WCB is rapidly moving down a pathway of increased corn and soybean cultivation. As a result, the window of opportunity for realizing the benefits of a biofuel industry based on perennial bioenergy crops, rather than corn ethanol and soy biodiesel, may be closing in the WCB.

agriculture | Great Plains | land capability | land cover change

High corn and soybean prices, prompted largely by demand for biofuel feedstocks, are driving one of the most important land cover/land use change (LCLUC) events in recent US history; the accelerated conversion of grassland to cropland in the US Corn Belt (1–5). Likely impacts of such conversion include a reduction in bird diversity across the region (6) and accruement of a significant carbon debt (7). For example, reductions in soil carbon sequestration caused by grassland conversion may require more than three decades of biofuel substitution for fossil fuels to repay (8). The continued loss of native grasslands is also an important issue with respect to ecosystem conservation. Temperate grassland is the most-altered biome globally, and temperate grasslands are the least protected ecosystems in the countries where they occur (9). In the Corn Belt, nearly all tallgrass prairie has been converted to agricultural land uses, whereas conversion of mixed-grass prairie exceeds 70% (10). As a consequence, populations of grassland nesting birds are declining faster than any other group of birds in North America (11, 12).

Despite the importance of LCLUC in the Corn Belt, there is a lack of information on where, at what rates, and on what types of land current grassland conversion is occurring. Detailed studies of the economic drivers and biophysical correlates of grassland conversion have been conducted only over limited subsets of the Corn Belt (1, 2). Meanwhile, regional-scale studies of grassland conversion have been based on agricultural production statistics aggregated at the county level (3, 4), precluding large-area geospatial analysis of grassland conversion at farm to subcounty scales. Finally, most studies of grassland conversion (1–3) precede the doubling of corn and soybean prices between 2006 and 2011 (13), with the exception of one (4). From 2006 to 2008, the corn and soybean area harvested in the United States increased by more than 3.2 million ha (4). Farm-level surveys showed that nearly one third of this increase came from conversion of grass-dominated land covers to cultivated cropland (4). Since 2008, however, there has been no regional-scale accounting of grassland conversion in the Corn Belt.

The present study addresses knowledge gaps evident in previous research by assessing very recent grassland conversion (2006–2011) at relatively high spatial resolution (560 m) across the Western Corn Belt (WCB). The WCB encompasses five states—North Dakota, South Dakota, Nebraska, Minnesota, and Iowa—and contains most of the grass-dominated land cover remaining in the Corn Belt (Fig. 1*A* and Fig. S1). The WCB also intersects much of the Prairie Pothole Region (PPR; Fig. 1*B*), a wetland landscape of continental significance (14–16).

We analyzed contemporary grassland conversion in the WCB by using the National Agricultural Statistics Service (NASS) Cropland Data Layer (CDL). The NASS CDL is derived from satellite imagery and maps agricultural land cover at very high crop-type specificity (from apples to watermelons) at a 56-m spatial resolution (17–19). The NASS CDL is also a relatively new dataset, having been available for all five states in the WCB only since 2006. Thus, we focused on grassland conversion through the 2011 growing season, using 2006 as a baseline. In brief, we addressed the following questions: (*i*) Where are the rates of grassland conversion to corn/soy agriculture highest in the WCB? (*ii*) Are the observed changes over this period consistent with longer-term trends of land cover change? (*iii*) What are the agronomic and environmental characteristics of land currently being converted from grassland to corn/soy? (*iv*) To what degree are wetlands, a habitat of regional and international significance, being impacted by these changes?

Results and Discussion

Grass-dominated land cover in the WCB ranges from native prairie to anthropogenically modified grassland types including grass pasture and hay lands, in addition to retired cropland converted to perennial grasses through the Conservation Reserve Program (CRP). Given their spectral similarity, these different grass cover types are difficult to resolve in satellite imagery. For example, accuracy rates for the grass hay and fallow/idle cropland classes in the NASS CDL are typically less than 50% (17). By contrast, reported classification accuracies for corn and soybeans exceed 90% (18, 19). We combined all the grass-dominated classes in the NASS CDL—native grassland, grass pasture, grass hay, fallow/idle cropland, and pasture/hay—to create a broadly defined grass-dominated class. In doing so, we make an important assumption that this generalized class subsumes classification errors which might otherwise occur between different types of grass-dominated land cover. For purposes of brevity, we refer to this generic class simply as "grassland."

Author contributions: C.K.W. and M.C.W. designed research, performed research, analyzed data, and wrote the paper.

The authors declare no conflict of interest.

This article is a PNAS Direct Submission.

Freely available online through the PNAS open access option.

[1]To whom correspondence should be addressed. E-mail: christopher.wright@sdstate.edu.

This article contains supporting information online at www.pnas.org/lookup/suppl/doi:10.1073/pnas.1215404110/-/DCSupplemental.

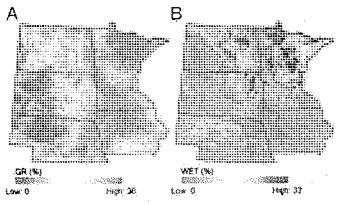


Fig. 1. Grasslands and wetlands in the WCB. Each map consists of smoothed percent cover at 560-m spatial resolution. (*A*) Percent grassland cover from the 2006 NASS CDL. (*B*) Percent wetland cover from the 2006 National Land Cover Dataset (53). The red outline indicates boundaries of the PPR within the WCB (52).

Grassland conversion between 2006 and 2011 was mostly concentrated in North Dakota and South Dakota, east of the Missouri River (Fig. 2*A*). Here, corn and soybean cropping has expanded westward into the transition zone between humid climates representative of the Corn Belt in general and the arid steppe of the High Plains (20). Similar westward expansion of the Corn Belt was found in Nebraska (Fig. 2*A*). The western periphery of the Corn Belt is characterized by a climate whereby mean annual evapotranspiration exceeds mean annual precipitation (21), suggesting that farmers here are willing to accept higher levels of drought risk in seeking higher cash returns from corn and soybeans. Federal crop insurance and disaster relief programs mitigate this risk, creating incentives for converting grassland to cropland, potentially at cross purposes with other national policies intended to conserve grasslands (3, 22, 23). In Minnesota and Iowa, grassland conversion forms a ring of LCLUC surrounding the core corn/soybean region in southern Minnesota and northern Iowa (Fig. 2*A*). Here crop production has expanded not into a less suitable climate per se, but rather onto less suitable land.

Cropping systems in the northern Great Plains often include grass hay or pasture rotated with corn and soybeans. This can result in substantial LCLUC from annual crops to grass-dominated land covers (3). Change from corn/soy to our generalized grassland class may also reflect fallow/idle lands that have temporarily been removed from crop production. We found that corn/soy to grassland change occurred predominantly along the western margin of the Corn Belt (Fig. 2*B*), and at much lower rates than grassland conversion (Fig. 2*C*). In sum, we found a net decline in grass-dominated land cover in the WCB totaling nearly 530,000 ha (>1.3 million acres; Table 1). This change was concentrated in two states, South Dakota and Iowa, with the majority of grassland conversion occurring in the WCB's three western states relative to the core corn/soy growing areas in Iowa and Minnesota (Table 1).

Normalizing absolute rates of grassland conversion (Fig. 2*A*) by grassland cover in 2006 (Fig. 1*A*), we generated a map of relative grassland conversion rates (Fig. 2*D*). This map reveals an arc of intermediate grass cover along the western edge of the Corn Belt (Fig. 1*A*) where grassland is being converted to corn or soybeans at comparatively fast rates; 5% to 30% from 2006 to 2011 (annualized rates, ~1.0–5.4%). This range of annualized rates is very similar to grassland conversion rates predicted by an econometric model that takes into account recent increases in corn prices (2).

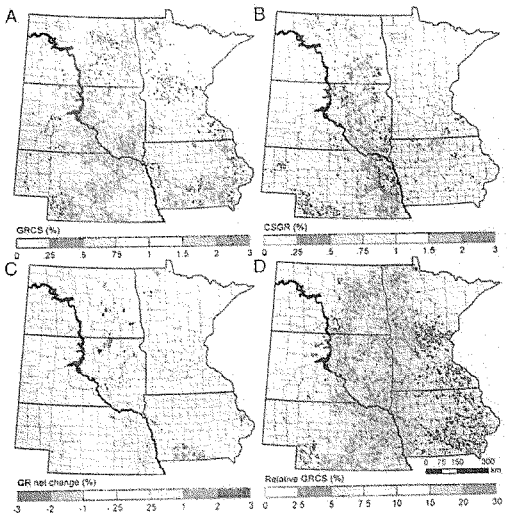


Fig. 2. LCLUC in the WCB. (*A*) Absolute change rate from grassland in 2006 to corn or soybeans in 2011 (GRCS). Smoothed absolute change rates at 560-m spatial resolution are calculated as the percentage of the landscape undergoing change (*Methods*). (*B*) Absolute change rate from corn or soybeans in 2006 to grassland in 2011 (CSGR). (*C*) Net result of GRCS and CSGR types of land cover change. Net change in grassland cover is calculated as CSGR minus GRCS, i.e., by subtracting the GRCS surface in *A* from the CSGR surface in *B*. Note this is not the same result one would obtain by comparing grassland cover in 2006 (i.e., Fig. 1*A*) with grassland cover in 2011, as we are ignoring transitions between grassland and other land classes exclusive of corn or soybeans. (*D*) Relative change rate from grassland in 2006 to corn or soybeans in 2011. Relative GRCS is calculated by normalizing absolute GRCS in *A* by grassland cover in 2006 (Fig. 1*A*).

Table 1. Area of LCLUC from 2006 to 2011

State	Area, ha * 10^3 (acres * 10^3)		
	Grassland to corn/soy	Corn/soy to grassland	Grassland net loss
North Dakota	129 (320)	40 (100)	89 (220)
South Dakota	256 (632)	73 (181)	182 (451)
Minnesota	92 (228)	13 (31)	80 (196)
Iowa	195 (481)	42 (104)	152 (376)
Nebraska	125 (309)	100 (247)	25 (62)
Sum	797 (1,969)	268 (663)	528 (1,306)

In those parts of Iowa outside the core corn/soy region, relative conversion rates were also comparably high (Fig. 2*D*).

One potential pitfall of inferring substantial grassland conversion over a relatively short interval like 2006 to 2011 is the possibility that such change is more a reflection of short-term variability in crop rotation patterns, rather than an underlying trend or enduring shift in land cover/land use. Also, by inferring change from two temporal snapshots, our results are potentially sensitive to measurement errors at one or both dates. However, longer-term NASS CDL agricultural data are available for only two states in the WCB, North Dakota and Iowa. We used these annual NASS CDL classifications from 2001 to 2011 to analyze trends in percent corn/soy cover and percent grass cover (Fig. 3). We found that elevated grass-to-corn/soy conversion rates in eastern North Dakota over the shorter term, 2006 to 2011 (Fig. 2*D*), were consistent with significant trends of increasing corn/soy cover ($P < 0.05$; Fig. 3*A*) and decreasing grassland cover ($P < 0.05$; Fig. 3*B*) over the longer period of 2001 to 2011. In Iowa, longer-term grassland trends were almost uniformly negative (Fig. 3*D*). Significantly positive corn/soy trends ($P < 0.05$) were concentrated in the southwestern and southeastern portions of the state (Fig. 3*C*). Thus, the pattern of higher relative grassland conversion rates outside the core corn/soy region in north-central Iowa (Fig. 2*D*) was broadly consistent with those areas where longer-term corn/soy trends are positive and grassland trends are negative. In sum, results from trend analyses in North Dakota and Iowa suggest that our approach to inferring grassland conversion across the entire WCB using NASS CDL data from 2006 and 2011—an approach made necessary by limited data availability—is representative of longer-term LCLUC region-wide.

Next, we consider the agronomic and environmental attributes of lands on which grassland conversion has occurred. In aggregate, conversion has been concentrated on more marginal lands characterized by high erosion potential, shallow soils, poor drainage, and less suitable climates for corn/soy production (Fig. 4*A*). At the state level, however, different patterns emerge. In Minnesota, we found a high proportion of grassland conversion occurring on land characterized by excess wetness, pointing to a likely increase in anthropogenic drainage (Fig. 4*B*). In Minnesota and the Dakotas, grassland conversion was concentrated on relatively high quality class II lands (Fig. 4 *B*–*D*). This suggests that land owners in those states are seeking higher rates of return from high-quality pasture and hay lands by converting those lands to corn and soybean cultivation rather than continuing their use in local livestock production. Such a shift from livestock to corn/soy cropping is consistent with a tipping point at which increasing rates of return caused by, e.g., rising commodity prices, subsidized crop insurance, improved corn and soybean cultivars, and adoption of no-till technologies make grassland conversion more profitable than continued livestock production (3, 4, 23). By contrast, grassland conversion in Iowa was concentrated on less suitable land (Fig. 4*E*), likely reflecting a relative lack of higher quality land available for additional corn/soy production. Prevalence of the climate modifier in the Dakotas and Nebraska was consistent with the westward expansion of the Corn Belt, as discussed earlier, and northward expansion of the Corn Belt into areas with shorter growing seasons. Finally, we found grassland conversion in Nebraska more evenly distributed across lands highly unsuited to crop production (Fig. 4*F*), suggesting an increase in irrigation practices largely concentrated in southwest Nebraska (cf. ref. 24).

The WCB intersects much of the PPR (Fig. 1*B*), a region that encompasses the most productive waterfowl breeding habitat in North America (14, 15), in addition to important breeding grounds for neotropical migratory shorebirds (25). For duck species (*Anas* and *Aythya* spp.), nesting success in the PPR is critically related to the amount of grassland cover adjoining

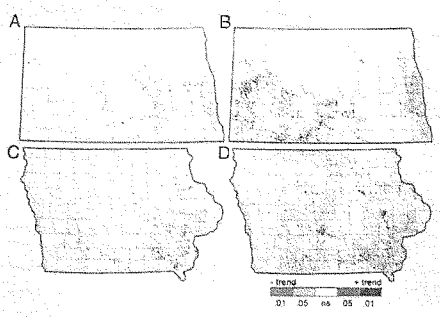


Fig. 3. Trend analysis of grassland and corn/soy percent cover over the period of 2001 to 2011. Nonparametric Mann–Kendall trend tests were conducted on percent corn/soy cover or percent grassland cover time series at 560-m spatial resolution. The color scheme indicates the sign (negative or positive trend) and significance level of geospatially referenced Mann–Kendall trend tests. (*A*) North Dakota corn/soy trends. (*B*) North Dakota grassland trends. (*C*) Iowa corn/soy trends. (*D*) Iowa grassland trends.

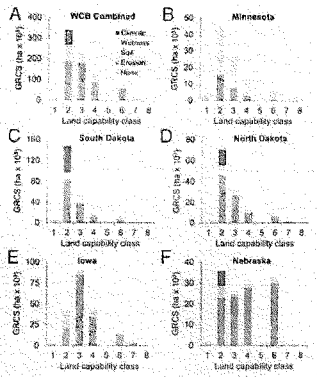


Fig. 4. Area of grassland conversion to corn or soybeans by land capability class. The Natural Resources Conservation Service ranks land by its suitability for agricultural production, with suitability declining as the index increases (49). Classes 1 to 4 are arable lands; classes 5 to 8 are suitable mainly as pasture or rangeland, and classes 3 and 4 have severe to very severe limitations, respectively. Class modifiers represent hazards affecting land use within a particular capability class. The climate modifier indicates low temperatures or a lack of moisture as major hazards affecting use. Excess wetness indicates soils with poor drainage, a high water table, or vulnerability to flooding. The soil modifier refers to soil limitations within the rooting zone; including shallow soils, rocky soils, or a low water-holding capacity. The erosion modifier indicates soils vulnerable to erosion or degraded by past erosion. (*A*) GRCS by land capability class for the entire WCB. (*B*–*F*) Results on a state-by-state basis.

wetlands, as such cover reduces nest predation (15). However, our results show that grassland conversion is occurring in very close proximity to PPR wetlands. In South Dakota, for example, nearly 100,000 ha of grassland conversion occurred within a 100-m buffer surrounding wetlands (Fig. 5*A*), with more than 80% of grassland conversion occurring within 500 m of neighboring wetlands (Fig. 5*B*). A nearly identical pattern was found in North Dakota (Fig. 5*B*), albeit over a lesser area (Fig. 5*A*). Comparatively fewer wetlands are found within the Minnesota portion of the PPR (Fig. 1*B*), with a more limited concentration of grassland conversion surrounding those wetlands (Fig. 5). Given that nearly all prairie pothole wetlands in Iowa have been lost to drainage (26), land use change in proximity to wetlands is negligible there. Finally, although grassland conversion within close proximity to wetlands in Nebraska was limited (Fig. 5), we note that Nebraska wetlands play a critical role as stopover habitat for migratory waterfowl and shorebirds (27).

Last, we examined the relationship between grassland conversion and lands protected under the CRP. The CRP pays farmers to establish and maintain grassland cover on retired cropland in exchange for a fixed rental payment over a fixed period. Given recent increases in corn and soybean prices, and projections that high commodity prices will be sustained, econometric models predict that landowners will be less likely to renew expiring CRP contracts given an expectation of higher rates of return from resuming crop production (28, 29). This has led some to project a substantial decline in CRP enrollment in the Northern Great Plains (5). Although county-level CRP data shows a decrease in CRP enrollment in the Dakotas and northwestern Minnesota from 2006 to 2011 (Fig. 6*A*), this decrease was not nearly as large as would have taken place if a more widespread failure to renew CRP contracts had occurred (5). In North Dakota, we found that county-level decreases in CRP enrollment generally exceeded grassland-to-corn/soy change (Fig. 6*B*). Here, grassland conversion might be largely attributed to a resumption of cropping on CRP lands. However, in far eastern North Dakota, eastern South Dakota, and Nebraska, grassland conversion generally exceeded changes in CRP (Fig. 6*B*). This result suggests an expansion of corn and soybean cropping onto grassland beyond those lands formerly protected by the CRP.

Other implications of results in Figs. 4–6 are several-fold. The concentration of grassland conversion on lands vulnerable to erosion implies negative impacts on soil quality and a subsequent cascade of negative impacts on, e.g., crop yields, primary productivity, and carbon sequestration (30). Tillage of adjacent uplands increases sediment inputs to PPR wetlands by several orders of magnitude (31), limiting the productivity of duck food sources, including aquatic plants and invertebrates, and reducing flood water storage (32). With respect to surface water hydrology, grassland conversion has been linked to historical increases in peak streamflows (and their variance) in the WCB, with a subsequent increase in flood risk (33). As noted earlier, the concentration of grassland conversion in Minnesota on lands characterized by excess wetness implies an increase in anthropogenic drainage. In Minnesota, extensive modification of presettlement drainage patterns has been shown to substantially modify stream geomorphology and increase sediment transport (34). Finally, the expansion of corn and soybean cultivation into less suitable climates and onto soils with lower water-holding capacities implies an elevated vulnerability to drought. Such vulnerability is exemplified by impacts of the unusually severe 2012 US drought. Here, negative vegetation anomalies were concentrated along the western periphery of the WCB whereas the core corn/soy region in southern Minnesota and northern Iowa exhibited positive vegetation anomalies (Fig. S2).

One shortcoming of the present study was our inability to use the NASS CDL to distinguish between different types of grassland conversion, i.e., to separate native prairie conversion from change involving CRP, hay lands, or grass pasture. Given the high conservation risk to temperate grasslands in the United States (9), we suggest that the NASS focus on improving their ability to identify native grasslands in the NASS CDL. There is a clear need to develop more effective approaches for grassland classification, and to apply these techniques for annual grassland monitoring in the WCB and other rapidly changing agricultural regions.

Broadly speaking, our results illustrate important heterogeneities in the geography of grassland conversion. With respect to biofuel development, the implications of such heterogeneity have generally been overlooked. For example, analyses of the effects of biofuel expansion typically simulate LCLUC by converting CRP lands to crop production (35, 36). Although such an approach may be reasonable in states like North Dakota, where CRP losses generally exceed grass-to-corn/soy change (Fig. 6*B*),

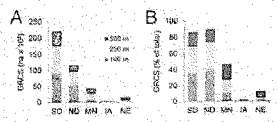


Fig. 5. Grassland conversion as a function of buffer distance around palustrine wetlands in the PPR. The source of wetland locations for this analysis was the National Wetlands Inventory (51). (*A*) Total area of grassland conversion by state within 100, 250, and 500 m of palustrine wetlands in the PPR. (*B*) Grassland conversion within wetland buffers as a percentage of the total amount of grassland conversion occurring in each state's portion of the PPR.

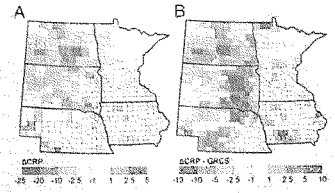


Fig. 6. Enrollment in the CRP relative to grassland conversion. (*A*) Change in land area enrolled in the CRP from 2006 to 2011 at the county level (in ha * 10^3). Negative values indicate a net loss in CRP area, positive values a net increase. Analysis based on county-level CRP data from the US Department of Agriculture (54). (*B*) Difference between CRP change and GRCS conversion. Negative values indicate counties in which CRP losses are greater than GRCS conversion. Positive values indicate counties in which GRCS conversion exceeds CRP losses.

this strategy would likely underestimate change in eastern South Dakota, where grassland conversion exceeds CRP losses. We also find that studies that simulate LCLUC as limited to marginal lands, e.g., land capability classes III or higher (5), may miss substantial grassland conversion occurring on higher quality class II lands (Fig. 4).

Conclusions

Our results show that rates of grassland conversion to corn/soy (1.0–5.4% annually) across a significant portion of the US Western Corn Belt are comparable to deforestation rates in Brazil, Malaysia, and Indonesia (37, 38), countries in which tropical forests were the principal sources of new agricultural land, globally, during the 1980s and 1990s (39). Historically, comparable grassland conversion rates have not been seen in the Corn Belt since the 1920s and 1930s (40), the era of rapid mechanization of US agriculture. Across the WCB, more than 99% of presettlement tallgrass prairie has been converted to other land covers, mostly agricultural, with losses in Iowa approaching 99.9% of an original 12-million-ha of tallgrass prairie (10). Potential expansion of corn and soybean cultivation into remaining fragments of tallgrass prairie in the WCB presents a critical ecosystem conservation issue (9).

Under the most likely climate change scenario for the Northern Great Plains, a 3- to 4-°C increase in mean annual temperature offset by a 10% increase in mean annual precipitation, much of the wetland habitat in the PPR is projected to be lost (14, 16). High-quality waterfowl habitat most likely to persist under climate change is projected to be concentrated in South Dakota east of the Missouri River (14, 16). However, this is precisely where grassland conversion in close proximity to PPR wetlands is most prevalent (Fig. 5). LCLUC in eastern South Dakota poses a dual threat to what may be one of the most important climate-change refugia for North American waterfowl.

With respect to biofuel development, Tilman et al. (35) point to risks of the US biofuel industry developing down counterproductive pathways if public policy and economic incentives are not properly aligned with delivered benefits. A number of studies have now shown that a biofuel strategy based on corn ethanol and soy biodiesel may indeed be suboptimal in terms of net energy and carbon balances (5, 7, 36) and negative impacts on other ecosystem services (5, 41, 42). Our results show that the WCB is rapidly moving down the corn ethanol and soy biodiesel pathway, with an estimated net loss of ~528,000 ha (1.3 million acres) of grassland from 2006 to 2011. Our methodology, which generated relatively high-resolution estimates of LCLUC rates (Fig. 2) over the most rapid (and important) period of biofuel expansion, might be uniquely suited as an input for estimating the direct greenhouse gas signature of a US biofuel industry based primarily on corn ethanol (cf. refs. 8, 36, 43–45).

Cellulosic biofuels produced from perennial feedstocks have a number of desirable attributes with respect to net energy and greenhouse gas balances (43–45) and wildlife conservation (5, 6). Many of these positive attributes could be realized in the WCB by planting perennial bioenergy crops (e.g., switchgrass, *Panicum virgatum*) or diverse prairie (44) on lands currently in corn and soybean cultivation. However, the carbon debt arising from grassland conversion is largely accrued during the conversion process and 2 to 3 y of tillage postconversion (7, 46). Even if recently converted grasslands were subsequently converted to perennial bioenergy crops, substantial carbon debts would still persist. With respect to conservation of biodiversity and wetlands, the maintenance of mixed-grass prairie as pasture, or possible harvest of mixed-grass prairie as a cellulosic biofuel feedstock, is clearly a preferable alternative to grassland conversion. However, the development of a cellulosic biofuel industry in the United States has been slow (47). The present study indicates that the window of opportunity for realizing benefits of perennial bioenergy crops may be closing in the WCB.

Methods

We assessed grassland conversion in the WCB over the period 2006 to 2011 by using the 2006 NASS CDL as a baseline and comparing it with the 2011 NASS CDL on a per-pixel basis. Grass-dominated land covers in the 2006 NASS CDL were combined in a generalized grassland class whereas corn and soybean pixels in the 2011 NASS CDL were merged in a general corn/soy class. We then identified pixels that changed from grassland in 2006 to corn/soy in 2011. In doing so, we found numerous very small patches of grassland conversion (Fig. S3*A*). We assumed that the vast majority of these small patches were erroneously identified as LCLUC as a result of classification errors. Presumed errors were filtered out by running a five-pixel by five-pixel majority filter across the raw change layer (see details in Fig. S3). The resulting majority-filtered change layer contained objects that clearly resembled corn or soybean fields in size and shape (Fig. S3*B*). To assess LCLUC in the opposite direction, we identified pixels that changed from corn/soy in 2006 to grassland in 2011. We then applied the same five-by-five majority filter to this raw change layer. Majority-filtered change layers were subsequently used in tabulating total areas of grassland to corn/soy change and corn/soy to grassland change summarized in Table 1.

Because of the small sizes and scattered distribution of change areas, it was difficult to visualize regional patterns of LCLUC at the original 56-m spatial resolution. As a result, we used spatial smoothing techniques to create a regional change surface that highlighted local hotspots of change. Related approaches are used in fields such as spatial epidemiology to generate stable estimate of disease rates (48) but have not been broadly applied in the field of land change science. In our smoothing approach, change pixels at 56-m spatial resolution were first aggregated to the percentage of change at 560-m resolution. This was done by taking 10-by-10 blocks of 56-m pixels (i.e., 100 pixel blocks) and summing the binary change within each block (Fig. S4*A*). Next we used a 2D kernel smoother to compute a smoothed estimate of percent change for each of the 560-m resolution pixels (Fig. S4*B*). A quartic kernel function was used to calculate moving averages across the study area at a bandwidth of 10 km. The same quartic kernel function was used to smooth percent change from corn/soy in 2006 to grassland in 2011. Finally, we generated a smoothed map of grassland cover in 2006 by aggregating grassland presence at 56-m resolution to percent grassland cover at 560-m resolution, and then smoothing this aggregated cover layer by using the same 10-km quartic kernel. This smoothed grassland cover layer was subsequently used as the denominator in generating a map of relative rates of grassland conversion.

In Iowa and North Dakota, we used annual NASS CDL land cover classifications over the period 2001 to 2011 to analyze longer-term trends in corn/soy and grassland land cover. These are the only states in the WCB in which such longer-term land use data are available. In each year, corn and soybean pixels were combined in a corn/soy class at 56-m resolution and then aggregated to percent corn/soy cover at 560-m resolution. Similarly, pixels falling in our generalized grassland class were aggregated to create annual maps of percent grassland cover at 560-m resolution. At each 560-m pixel, we then tested the 2001 to 2011 time series for presence of a monotonic trend by using the nonparametric Mann–Kendall trend test.

We evaluated the suitability for crop production on lands where grassland conversion is occurring using the Soil Survey Geographic Database [SSURGO (49)]. The majority-filtered grassland to corn/soy change layer (e.g., Fig. S3*D*) was overlaid on the SSURGO Non-Irrigated Capability Class-Dominant Condition layer (50) to extract the distribution of land capability classes within areas undergoing grassland conversion. The proximity of LCLUC to wetlands was evaluated with respect to palustrine wetlands identified by the National Wetlands Inventory [NWI (51)]. This analysis was confined to those parts of the WCB contained within the boundaries of the PPR (52). Buffer regions surrounding palustrine polygons mapped by the NWI were drawn at 100, 250, and 500 m distances. We then overlaid the majority-filtered grass to corn/soy change layer to determine the total area of grassland conversion occurring within those buffers.

ACKNOWLEDGMENTS. This research was supported by the US Department of Energy through the Sun Grant Initiative's Regional Biomass Feedstock Partnership and by National Science Foundation Macrosystems Biology Program Grant 1065865.

1. Stephens SE, et al. (2008) Predicting risk of habitat conversion in native temperate grasslands. *Conserv Biol* 22(5):1320–1330.
2. Rashford BS, Walker JA, Bastian CT (2011) Economics of grassland conversion to cropland in the prairie pothole region. *Conserv Biol* 25(2):276–284.
3. Claassen R, Carriazo F, Cooper JC, Hellerstein D, Ueda K (2011) *Grassland to Cropland Conversion in the Northern Plains: The Role of Crop Insurance, Commodity, and Disaster Programs. Economic Research Report No. ERR-120* (US Department of Agriculture Economic Research Service, Washington, DC).
4. Wallender S, Claassen R, Nickerson C (2011) *The Ethanol Decade: An Expansion of U.S. Corn Production, 2000–2009. EIB-79* (US Department of Agriculture Economic Research Service, Washington, DC).
5. Fargione JE, et al. (2009) Bioenergy and wildlife: Threats and opportunities for grassland conservation. *Bioscience* 59:767–777.
6. Meehan TD, Hurlbert AH, Gratton C (2010) Bird communities in future bioenergy landscapes of the Upper Midwest. *Proc Natl Acad Sci USA* 107(43):18533–18538.
7. Fargione J, Hill J, Tilman D, Polasky S, Hawthorne P (2008) Land clearing and the biofuel carbon debt. *Science* 319(5867):1235–1238.
8. Gelfand I, et al. (2011) Carbon debt of Conservation Reserve Program (CRP) grasslands converted to bioenergy production. *Proc Natl Acad Sci USA* 108(33):13864–13869.
9. Hoekstra JM, Boucher TM, Ricketts TH, Roberts C (2005) Confronting a biome crisis: Global disparities of habitat loss and protection. *Ecol Lett* 8:23–29.
10. Samson FB, Knopf FL, Ostlie WR (1998) Grasslands. *Status and Trends of the Nation's Biological Resources*, eds Mac MJ, Opler PA, Puckett Haecker CE, Doran PD (Northern Prairie Wildlife Research Center, Jamestown, ND), Vol 2, pp 437–472.
11. Peterjohn BG, Sauer JR (1999) Population status of North American grassland birds. *Stud Avian Biol* 19:27–44.
12. Sauer JR, Fallon JE, Johnson R (2003) Use of North American Breeding Bird Survey data to estimate population change for bird conservation regions. *J Wildl Manage* 67:372–389.
13. US Department of Agriculture, National Agricultural Statistics Service (2012) *Quick Stats 2.0*. Available at http://nass.usda.gov/Quick_Stats/. Accessed August 9, 2012.
14. Johnson WC, et al. (2005) Vulnerability of northern prairie wetlands to climate change. *Bioscience* 55:863–872.
15. Stephens SE, Rotella JJ, Lindberg S, Taper ML, Ringelman JK (2005) Duck nest survival in the Missouri Coteau of North Dakota: Landscape effects at multiple spatial scales. *Ecol Appl* 15:2137–2149.
16. Johnson WC, et al. (2010) Prairie wetland complexes as landscape functional units in a changing climate. *Bioscience* 60:128–140.
17. US Department of Agriculture, National Agricultural Statistics Service (2012) *Cropland Data Layer Metadata*. Available at www.nass.usda.gov/research/Cropland/metadata/metadata.htm. Accessed August 9, 2012.
18. Johnson DM, Mueller R (2010) The 2009 cropland data layer. *Photogramm Eng Remote Sensing* 76:1201–1205.
19. Boryan C, Yang Z, Mueller R, Craig M (2011) Monitoring US agriculture: The USDA National Agricultural Statistics, Cropland Data Layer Program. *Geocarto Int* 84:111–123.
20. Kottek M, Grieser J, Beck C, Rudolf B, Rubel F (2006) World Map of the Köppen-Geiger climate classification updated. *Meteorol Z* 15:259–263.
21. Widrlechner MP (1999) A zonic map for mean annual moisture balance in the north central United States. *Landscape Plant News* 10:10–14.
22. US Government Accountability Office (2007) *Agricultural Conservation: Farm Program Payments Are an Important Factor in Landowner's Decisions to Convert Grassland to Cropland. Report to Congressional Requesters, GAO-07-1054* (US Government Accountability Office, Washington, DC).
23. Claassen R, Cooper JC, Carriazo F (2011) Crop insurance, disaster payments, and land use change: The effects of Sodsaver on incentives for grassland conversion. *J Ag Appl Econ* 43:195–211.
24. McKusick VL (2003) *Final Report of the Special Master with Certificate of Adoption of Republican River Compact Administration Groundwater Model* (Supreme Court of the United States, Washington, DC).
25. Johnson DH (1996) Management of northern prairies and wetlands for the conservation of Neotropical migratory birds. *Management of Midwestern Landscapes for the Conservation of Neotropical Migratory Birds. Forest Service General Technical Report NC-187*, ed Thompson FR III (US Department of Agriculture, Washington, DC), pp 53–67.
26. Dahl TE (1990) *Wetland Losses in the United States: 1780s to 1980s* (US Fish and Wildlife Service, Washington, DC).
27. Skagen SK, Sharpe PB, Waltermire RG, Dillon MB (1999) *Biogeographical Profiles of Shorebird Migration in Midcontinental North America. US Geological Survey Biological Science Report 2000–2003* (US Geological Survey, Reston, VA).
28. Secchi S, Gassman PW, Williams JR, Babcock BA (2009) Corn-based ethanol production and environmental quality: A case of Iowa and the conservation reserve program. *Environ Manage* 44(4):732–744.
29. Hellerstein D, Malcolm S (2011) *The Influence of Rising Commodity Prices on the Conservation Reserve Program*, ERR-110, USDA Economic Research Service (US Department of Agriculture, Washington, DC).
30. Gregorich EG, Greer KJ, Anderson DW, Liang BC (1998) Carbon distribution and losses: Erosion and deposition effects. *Soil Tillage Res* 47:291–302.
31. Gleason RA, Euliss NH (1998) Sedimentation of prairie wetlands. *Great Plains Res* 8:97–112.
32. Gleason RA, Euliss NH, Tangen BA, Laubhan MK, Browne BA (2011) USDA conservation program and practice effects on wetland ecosystem services in the Prairie Pothole Region. *Ecol Appl* 21:S65–S81.
33. Villarini G, Smith JA, Baeck ML, Krajewski W (2011) Examining flood frequency distributions in the Midwest U.S. *J Am Water Resour Assoc* 47:447–463.
34. Lenhart CF, Verry ES, Brooks KN, Magner JA (2011) Adjustment of prairie pothole streams to land-use, drainage, and climate changes and consequences for turbidity impairment. *Riv Res Appl* 28(10):1609–1619.
35. Tilman D, et al. (2009) Energy. Beneficial biofuels—the food, energy, and environment trilemma. *Science* 325(5938):270–271.
36. Hill J, Nelson E, Tilman D, Polasky S, Tiffany D (2006) Environmental, economic, and energetic costs and benefits of biodiesel and ethanol biofuels. *Proc Natl Acad Sci USA* 103(30):11206–11210.
37. Lepers E, et al. (2005) A synthesis of information on rapid land-cover change for the period 1981–2000. *Bioscience* 55:115–124.
38. Hansen MC, et al. (2008) Humid tropical forest clearing from 2000 to 2005 quantified by using multitemporal and multiresolution remotely sensed data. *Proc Natl Acad Sci USA* 105(27):9439–9444.
39. Gibbs HK, et al. (2010) Tropical forests were the primary sources of new agricultural land in the 1980s and 1990s. *Proc Natl Acad Sci USA* 107(38):16732–16737.
40. Ramankutty N, Foley JA (1999) Estimating historical changes in global land cover: Croplands from 1970 to 1992. *Global Biogeochem Cycles* 13:997–1027.
41. Donner SD, Kucharik CJ (2008) Corn-based ethanol production compromises goal of reducing nitrogen export by the Mississippi River. *Proc Natl Acad Sci USA* 105(11):4513–4518.
42. Landis DA, Gardiner MM, van der Werf W, Swinton SM (2008) Increasing corn for biofuel production reduces biocontrol services in agricultural landscapes. *Proc Natl Acad Sci USA* 105(51):20552–20557.
43. Schmer MR, Vogel KP, Mitchell RB, Perrin RK (2008) Net energy of cellulosic ethanol from switchgrass. *Proc Natl Acad Sci USA* 105(2):464–469.
44. Tilman D, Hill J, Lehman C (2006) Carbon-negative biofuels from low-input high-diversity grassland biomass. *Science* 314(5805):1598–1600.
45. Georgescu M, Lobell DB, Field CB (2011) Direct climate effects of perennial bioenergy crops in the United States. *Proc Natl Acad Sci USA* 108(11):4307–4312.
46. Grandy AS, Robertson GP (2006) Cultivation of a temperate-region soil at maximum carbon equilibrium immediately accelerates aggregate turnover and CO2 and N2O emissions. *Glob Change Biol* 12:1507–1520.
47. Schnepf R (2012) *Agriculture-Based Biofuels: Overview and Emerging Issues* (Congressional Research Service, Washington, DC).
48. Waller LA, Gotway CA (2004) *Applied Spatial Statistics for Public Health Data* (Wiley, Hoboken, NJ).
49. US Department of Agriculture, Natural Resources Conservation Service (2012) *Soil Survey Geographic (SSURGO) Database*. Available at http://soildatamart.nrcs.usda.gov. Accessed August 9, 2012.
50. US Department of Agriculture, Natural Resources Conservation Service (2012) *SSURGO 2.2.5 Table Column Descriptions*. Available at http://soildatamart.nrcs.usda.gov/SSURGOMetadata.aspx. Accessed August 9, 2012.
51. US Department of the Interior, Fish and Wildlife Service (2012) *National Wetlands Inventory*. Available at www.fws.gov/wetlands/. Accessed August 1, 2012.
52. Ducks Unlimited (2012) *DU International Conservation Planning Regions*. Available at www.ducks.org/conservation/gis/gis-spatial-data-download/page2. Accessed August 11, 2012.
53. Vogelmann JE, et al. (2001) Completion of the 1990s National Land Cover Data Set for the conterminous United States from Landsat Thematic Mapper data and ancillary data sources. *Photogramm Eng Remote Sensing* 67:650–662.
54. US Department of Agriculture, Farm Service Agency (2012) *CRP Enrollment and Rental Payments by County, 1986–2011*. Available at www.fsa.usda.gov/FSA/webapp?area=home&subject=copr&topic=crp-st. Accessed September 4, 2012.

Supporting Information

Wright and Wimberly 10.1073/pnas.1215404110

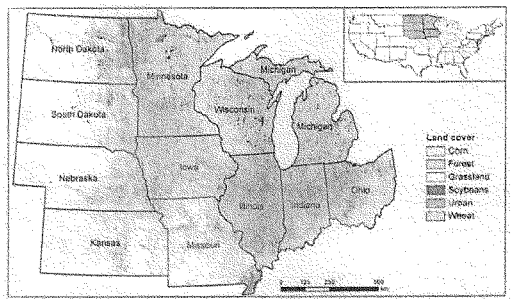


Fig. S1. The US Corn Belt extending from central Ohio in the east to the Dakotas and Nebraska in the west. Because corn is typically grown in rotation with soybeans, the Corn Belt might be better termed the Corn/Soy Belt. Corn cover is shown in yellow, soybean cover is green. Additional major land cover classes are included in the key. Image based on data from the 2011 National Agricultural Statistics Service Cropland Data Layer (CDL, ref. 1). (*Inset*) The five states comprising the Western Corn Belt are shaded dark gray.

1. US Department of Agriculture, National Agricultural Statistics Service (2012) *Cropland Data Layer Metadata*. Available at www.nass.usda.gov/research/Cropland/metadata/meta.htm. Accessed August 9, 2012

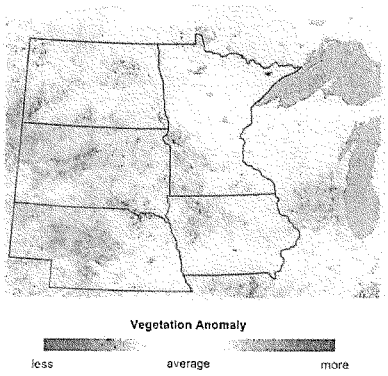


Fig. S2. Vegetation anomalies for the period of June 25 to July 10, 2012. Image constructed from an analysis by the NASA Earth Observatory, downloaded as a geotiff from ref. 1. Anomalies are based on the Normalized Difference Vegetation Index and are relative to average conditions over the period 2002 to 2012 (1).

1. NASA Earth Observatory (2012) Drought Grips the United States. Available at http://earthobservatory.nasa.gov/IOTD/view.php?id=78553. Accessed July 18, 2012.

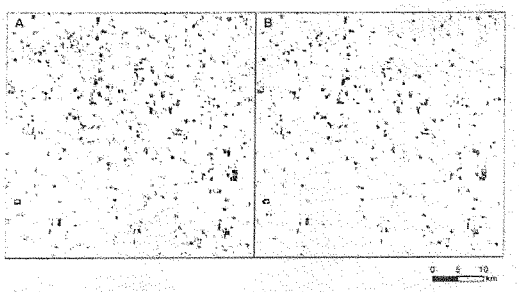


Fig. S3. Grassland to corn/soy change identified by overlaying the 2006 CDL on the 2011 CDL. (*A*) Change pixels identified as grassland in 2006 that were subsequently classified as corn or soybeans in 2011. This overlay identifies a very large number of small change areas. We assume that most of this speckle is not actual change but arises from classification errors in the source data. (*B*) Majority filtering of the raw change layer. A five-pixel by five-pixel moving window is applied to *A*. The center pixel of the moving window is classified as change if the majority of pixels within the window are change pixels (spatial resolution, 56 m).

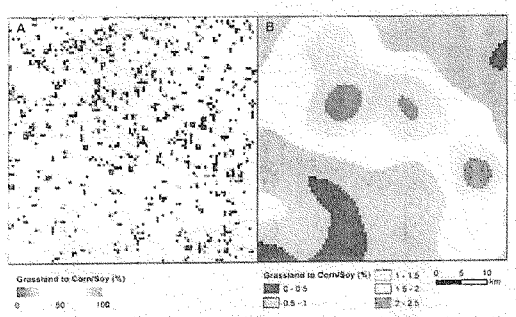


Fig. S4. Aggregation of grassland to corn/soy change at 56-m spatial resolution to change at 560-m resolution. (*A*) The binary change layer in Fig. S3*B* (resolution, 56 m) is converted to the percentage of change within 560-m pixels. White indicates no change. (*B*) Smoothing of *A* using a quartic kernel function at a bandwidth of 10 km.

RollingStone

The Ethanol Scam

Politicians are high on turning corn into fuel — but ethanol not only hurts the environment, it's also one of America's biggest political boondoggles

by JEFF GOODELL
MARCH 23, 2011

The great danger of confronting peak oil and global warming isn't that we will sit on our collective asses and do nothing while civilization collapses, but that we will plunge after "solutions" that will make our problems even worse. Like believing we can replace gasoline with ethanol, the much-hyped biofuel that we make from corn.

The Dark Lord of Coal Country

Ethanol, of course, is nothing new. American refiners will produce nearly 6 billion gallons of corn ethanol this year, mostly for use as a gasoline additive to make engines burn cleaner. But in June, the Senate all but announced that America's future is going to be powered by biofuels, mandating the production of 36 billion gallons of ethanol by 2022. According to ethanol boosters, this is the beginning of a much larger revolution that could entirely replace our 21-million-barrel-a-day oil addiction. Midwest farmers will get rich, the air will be cleaner, the planet will be cooler, and, best of all, we can tell those greedy sheiks to fuck off. As the king of ethanol hype, Sen. Chuck Grassley of Iowa, put it recently, "Everything about ethanol is good, good, good."

This article appeared in the August 7, 2007 issue of Rolling Stone. The issue is available in the online archive.

This is not just hype — it's dangerous, delusional bullshit. Ethanol doesn't burn cleaner than gasoline, nor is it cheaper. Our current ethanol production represents only 3.5 percent of our gasoline consumption — yet it consumes twenty percent of the entire U.S. corn crop, causing the price of corn to double in the last two years and raising the threat of hunger in the Third World. And the increasing acreage devoted to corn for ethanol means less land for other staple crops, giving farmers in South America an incentive to carve fields out of tropical forests that help to cool the planet and stave off global warming.

12 Politicians and Execs Blocking Progress on Global Warming

So why bother? Because the whole point of corn ethanol is not to solve America's energy crisis, but to generate one of the great political boondoggles of our time. Corn is already the most subsidized

crop in America, raking in a total of $51 billion in federal handouts between 1995 and 2005 — twice as much as wheat subsidies and four times as much as soybeans. Ethanol itself is propped up by hefty subsidies, including a fifty-one-cent-per-gallon tax allowance for refiners. And a study by the International Institute for Sustainable Development found that ethanol subsidies amount to as much as $1.38 per gallon — about half of ethanol's wholesale market price.

Q&A: Bill Gates on How to Stop Global Warming

Three factors are driving the ethanol hype. The first is panic: Many energy experts believe that the world's oil supplies have already peaked or will peak within the next decade. The second is election-year politics. With the first vote to be held in Iowa, the largest corn-producing state in the nation, former skeptics like Sens. Hillary Clinton and John McCain now pay tribute to the wonders of ethanol. Earlier this year, Sen. Barack Obama pleased his agricultural backers in Illinois by co-authoring legislation to raise production of biofuels to 60 billion gallons by 2030. A few weeks later, rival Democrat John Edwards, who is staking his campaign on a victory in the Iowa caucus, upped the ante to 65 billion gallons by 2025.

Coal's Toxic Sludge

The third factor stoking the ethanol frenzy is the war in Iraq, which has made energy independence a universal political slogan. Unlike coal, another heavily subsidized energy source, ethanol has the added political benefit of elevating the American farmer to national hero. As former CIA director James Woolsey, an outspoken ethanol evangelist, puts it, "American farmers, by making the commitment to grow more corn for ethanol, are at the top of the spear on the war against terrorism." If you love America, how can you not love ethanol?

Ethanol is nothing more than 180-proof grain alcohol. To avoid the prospect of drunks sucking on gas pumps, fuel ethanol is "denatured" with chemical additives (if you drink it, you'll end up dead or, at best, in the hospital). It can be distilled from a variety of plants, including sugar cane and switch-grass. Most vehicles can't run on pure ethanol, but E85, a mix of eighty-five percent ethanol and fifteen percent gasoline, requires only slight engine modifications.

But as a gasoline substitute, ethanol has big problems: Its energy density is one-third less than gasoline, which means you have to burn more of it to get the same amount of power. It also has a nasty tendency to absorb water, so it can't be transported in existing pipelines and must be distributed by truck or rail, which is tremendously inefficient.

Nor is all ethanol created equal. In Brazil, ethanol made from sugar cane has an energy balance of 8-to-1 — that is, when you add up the fossil fuels used to irrigate, fertilize, grow, transport and refine sugar cane into ethanol, the energy output is eight times higher than the energy inputs. That's a better deal than gasoline, which has an energy balance of 5-to-1. In contrast, the energy balance of corn ethanol is only 1.3-to-1 — making it practically worthless as an energy source. "Corn ethanol is essentially a way of recycling natural gas," says Robert Rapier, an oil-industry engineer who runs the R-Squared Energy Blog.

The ethanol boondoggle is largely a tribute to the political muscle of a single company: agribusiness giant Archer Daniels Midland. In the 1970s, looking for new ways to profit from corn, ADM began pushing ethanol as a fuel additive. By the early 1980s, ADM was producing 175 million gallons of ethanol a year. The company's then-chairman, Dwayne Andreas, struck up a close relationship with Sen. Bob Dole of Kansas, a.k.a. "Senator Ethanol." During the 1992 election, ADM gave $1 million

to Dole and his friends in the GOP (compared with $455,000 to the Democrats). In return, Dole helped the company secure billions of dollars in subsidies and tax breaks. In 1995, the conservative Cato Institute, estimating that nearly half of ADM's profits came from products either subsidized or protected by the federal government, called the company "the most prominent recipient of corporate welfare in recent U.S. history."

Today, ADM is the leading producer of ethanol, supplying more than 1 billion gallons of the fuel additive last year. Ethanol is propped up by more than 200 tax breaks and subsidies worth at least $5.5 billion a year. And ADM continues to give back: Since 2000, the company has contributed $3.7 million to state and federal politicians.

The Iraq War has also been a boon for ADM and other ethanol producers. The Energy Policy Act of 2005, which was pushed by Corn Belt politicians, mandated the consumption of 7.5 billion gallons of biofuels by 2012. After Democrats took over Congress last year, they too vowed to "do something" about America's addiction to foreign oil. By the time Sen. Jeff Bingaman, chair of the Committee on Energy and Natural Resources, proposed new energy legislation this spring, the only real question was how big the ethanol mandate would be. According to one lobbyist, 36 billion gallons became "the Goldilocks number — not too big to be impractical, not too small to satisfy corn growers."

Under the Senate bill, only 15 billion gallons of ethanol will come from corn, in part because even corn growers admit that turning more grain into fuel would disrupt global food supplies. The remaining 21 billion gallons will have to come from advanced biofuels, most of which are currently brewed only in small-scale lab experiments. "It's like trying to solve a traffic problem by mandating hovercraft," says Dave Juday, an independent commodities consultant. "Except we don't have hovercraft."

The most seductive myth about ethanol is that it will free us from our dependence on foreign oil. But even if ethanol producers manage to hit the mandate of 36 billion gallons of ethanol by 2022, that will replace a paltry 1.5 million barrels of oil per day — only seven percent of current oil needs. Even if the entire U.S. corn crop were used to make ethanol, the fuel would replace only twelve percent of current gasoline use.

Another misconception is that ethanol is green. In fact, corn production depends on huge amounts of fossil fuel — not just the diesel needed to plow fields and transport crops, but also the vast quantities of natural gas used to produce fertilizers. Runoff from industrial-scale cornfields also silts up the Mississippi River and creates a vast dead zone in the Gulf of Mexico every summer. What's more, when corn ethanol is burned in vehicles, it is as dirty as conventional gasoline and does little to solve global warming: E85 reduces carbon dioxide emissions by a modest fifteen percent at best, while fueling the destruction of tropical forests.

But the biggest problem with ethanol is that it steals vast swaths of land that might be better used for growing food. In a recent article in *Foreign Affairs* titled "How Biofuels Could Starve the Poor," University of Minnesota economists C. Ford Runge and Benjamin Senauer point out that filling the gas tank of an SUV with pure ethanol requires more than 450 pounds of corn — roughly enough calories to feed one person for a year.

Thanks in large part to the ethanol craze, the price of beef, poultry and pork in the United States rose more than three percent during the first five months of this year. In some parts of the country, hog farmers now find it cheaper to fatten their animals on trail mix, french fries and chocolate bars. And since America provides two-thirds of all global corn exports, the impact is being felt around the

world. In Mexico, tortilla prices have jumped sixty percent, leading to food riots. In Europe, butter prices have spiked forty percent, and pork prices in China are up twenty percent. By 2025, according to Runge and Senauer, rising food prices caused by the demand for ethanol and other biofuels could cause as many as 600 million more people to go hungry worldwide.

Despite the serious drawbacks of ethanol, some technological visionaries believe that the fuel can be done right. "Corn ethanol is just a platform, the first step in a much larger transition we are undergoing from a hydrocarbon-based economy to a carbohydrate-based economy," says Vinod Khosla, a pioneering venture capitalist in Silicon Valley. Next-generation corn- ethanol plants, he argues, will be much more efficient and environmentally friendly. He points to a company called E3 BioFuels that just opened an ethanol plant in Mead, Nebraska. The facility runs largely on biogas made from cow manure, and feeds leftover grain back to the cows, making it a "closed-loop system" — one that requires very few fossil fuels to create ethanol.

Khosla is even higher on the prospects for cellulosic ethanol, a biofuel that can be made from almost any plant matter, including wood waste and perennial grasses like miscanthus and switchgrass. Like other high-tech ethanol evangelists, Khosla imagines a future in which such so-called "energy crops" are fed into giant refineries that use genetically engineered enzymes to break down the cellulose in plants and create fuel for a fraction of the cost of today's gasoline. Among other virtues, cellulosic ethanol would not cut into the global food supply (nobody eats miscanthus or switchgrass), and it could significantly cut global-warming pollution. Even more important, it could provide a gateway to a much larger biotech revolution, including synthetic microbes that could one day be engineered to gobble up carbon dioxide or other pollutants.

Unfortunately, no commercial-scale cellulosic ethanol plants exist today. In one venture backed by Khosla, a $225 million plant in central Georgia is currently being built to make ethanol out of wood chips. Mitch Mandich, a former Apple Computer executive who is now the CEO of the operation, calls it "the beginning of a real transformation in the way we think about energy in America."

Maybe. But oil-industry engineer Robert Rapier, who has spent years studying cellulosic ethanol, says that the difference between ethanol from corn and ethanol from cellulose is "like the difference between traveling to the moon and traveling to Mars." And even if the engineering hurdles can be overcome, there's still the problem of land use: According to Rapier, replacing fifty percent of our current gasoline consumption with cellulosic ethanol would consume thirteen percent of the land in the United States - about seven times the land currently utilized for corn production.

Increasing the production of cellulosic ethanol will also require solving huge logistical problems, including delivering vast quantities of feedstock to production plants. According to one plant manager in the Midwest, fueling an ethanol plant with switchgrass would require delivering a semi-truckload of the grass every six minutes, twenty-four hours a day. Finally, there is the challenge of wrestling the future away from Big Corn. "It's pretty clear to me that the corn guys will use all their lobbying muscle and political power to stall, thwart and sidetrack this revolution," says economist C. Ford Runge.

In the end, the ethanol boom is another manifestation of America's blind faith that technology will solve all our problems. Thirty years ago, nuclear power was the answer. Then it was hydrogen. Biofuels may work out better, especially if mandates are coupled with tough caps on greenhouse-gas emissions. Still, biofuels are, at best, a huge gamble. They may help cushion the fall when cheap oil vanishes, but if we rely on ethanol to save the day, we could soon find ourselves forced to make a choice between feeding our SUVs and feeding children in the Third World. And we all know how

that decision will go.

http://www.rollingstone.com/politics/news/the-ethanol-scam-20110323

Ethanol quotas pump money from your pocket: Our view

The Editorial Board, USATODAY 12:39 p.m. EDT August 18, 2013

Fuel-efficient cars, new oil supplies make mandate obsolete.

When members of Congress decided in 2007 to require that Americans put 36 billion gallons of ethanol and other biofuels in their gas tanks annually by 2022, they must have thought there was an award for bad public policy.

The idea never made the slightest sense. The law, an expansion of a mandate adopted two years earlier, called for impossibly large quantities of corn to go into fuel production rather than onto people's tables, driving up food prices. This year, the mandate requires 16.6 billion gallons of biofuels, absurdly consuming 37% of the nation's corn crop and requiring farm land roughly equal to the size of Kentucky.

Now unforeseen events are adding a tragicomic twist.

Because of a decline in gasoline consumption — driven largely by a new generation of fuel-efficient cars — the only way to burn that much ethanol is to blend more into each gallon of gas. This is bad news for your car because automakers won't warranty their engines when they run a blend higher than the current 10% ethanol.

Refiners are left with only one viable option: buying credits known as RINs (for Renewable Identification Number) that provide an out. Under the bizarre ethanol law, each RIN that a refiner acquires is a gallon of ethanol that it doesn't have to blend.

Those RINs, which cost a few pennies last year, have traded for as much as $1.40 this year because of the mandate. Major refiners have spent hundreds of millions of dollars on them, enriching speculators and passing along their additional costs in form of higher fuel prices.

Recent estimates of the cost to consumers for this *RINsanity* come in at about 10 cents a gallon. A study by the non-profit Energy Research Policy Foundation projects that by next year, when the mandate will rise to 18.2 billion gallons, the purchase of RINs will push up the price of a gallon of fuel by 20 cents to $1.

Since the 2022 ethanol mandate is twice that level and another federal law mandates increasing fuel efficiency, one can only guess how big the hit will get.

Why would Congress fleece consumers in this way? There's only one reason: to please a well-organized farm lobby, which collects most of the money consumers are forced to waste.

All of the energy independence goals that the ethanol mandate was supposed to meet in 2022, have already been met — surpassed in fact — by developments that would have been unimaginable a few years ago.

New drilling technologies pushed up domestic oil production by 1.3 million barrels per day between 2005 and last year. Thanks to this increase, the aforementioned drop in gasoline consumption and the substitution of plentiful natural gas for oil in a number of uses, oil imports are plummeting. They have fallen by 3.1 million barrels a day since 2005 and now account for 40% of consumption (down from 60% in 2005) and are projected to fall further.

The Obama administration has some flexibility to lower the mandates, but a better approach would be to repeal the law entirely. There are no awards for bad laws. Only negative consequences.

USA TODAY's editorial opinions are decided by its Editorial Board, separate from the news staff. Most editorials are coupled with an opposing view — a unique USA TODAY feature.

Editor's note: This editorial has been updated to reflect that the composition of the annual renewable fuel mandate includes ethanol and other biofuels.

Should you be selling your stocks right now?
If you have a $500,000 portfolio, you should download the latest report by *Forbes* columnist Ken Fisher's firm. It tells you where we think the stock market is headed and why. This must-read report includes our latest stock market forecast, plus research and analysis you can use in your portfolio right now. Don't miss it!
Click Here to Download Your Report!

Dow Jones Reprints: This copy is for your personal, non-commercial use only. To order presentation-ready copies for distribution to your colleagues, clients or customers, use the Order Reprints tool at the bottom of any article or visit www.djreprints.com
• See a sample reprint in PDF format • Order a reprint of this article now

REVIEW & OUTLOOK

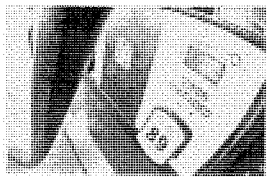
Big Ethanol Finally Loses

The political fuel is losing support as its costs and harm grow.

Nov. 17, 2013 6:07 p.m. ET

It's not often that the ethanol lobby suffers a policy setback in Washington, but it got its head handed to it Friday. The Environmental Protection Agency announced that for the first time it is lowering the federal mandate that dictates how much ethanol must be blended into the nation's gasoline. It's about time. It's been about time from the moment the ethanol mandate came to life in the 1970s.

The 16% reduction is a modest pullback, which EPA says will hold ethanol blends in gasoline at the standard 10% (E10). But we hope this is a precedent-setting victory. After 35 years of exaggerations about the benefits of renewable fuels, the industry has lost credibility.



Associated Press

For years the biofuels lobby has boasted that its product was a green alternative to emissions from oil and gas. But a growing body of scientific evidence is showing that ethanol consumes so much energy and fertilizer, and requires planting so much marginal cropland, that the impact on air quality is at best neutral and on water quality may be negative.

A report released earlier this year by the National Research Council concluded: "Although it may seem obvious that subsidizing biofuels should reduce CO2 emissions because they rely on renewable resources rather than fossil fuels, many studies we reviewed found the opposite." Environmental outfits such as the Environmental Working Group and the Sierra Club now oppose ethanol subsidies.

The EPA reduction is a small win for consumers. Since 1978 when the first "gasohol" subsidies were enacted, renewable fuel production tax credits have drained the Treasury of almost $40 billion. The tax subsidies expired recently, but consumers have still been forced to dole out billions at the pump because of the renewable fuel standards.

About 40% of corn production is now used not for food or livestock feed, but for fuel. This has raised the price of corn, and a 2009 study by the Congressional Budget Office found that in some years ethanol has raised retail food prices by 5% to 10% for everything from corn flakes to ground beef.

Related Video

EPA hopes to prevent a 2014 replay of the biofuels fiasco that hit the gasoline market this year. When the original

levels for renewable fuel standards were set in 2007, none of the sages in Washington anticipated that gasoline demand in the U.S. would plateau as it has over the past four years, largely because of more fuel-efficient cars.

Editorial page editor Paul Gigot on the EPA's decision to lower the required amount of ethanol that must be blended into gasoline. Photo credit: Getty Images.

This year's 14 billion gallon mandate required refiners such as Marathon and Valero to pay for hundreds of millions of gallons of renewable energy "credits" to avoid busting through the E10 blending wall. Few cars on the road are equipped to handle higher ethanol blends that can end up doing harm to engines. Despite a lack of demand, the ethanol lobby wants government to force a blend of E15 or higher on millions of consumers and force car makers to adapt their fleets to a fuel that offers less octane per mile traveled and no environmental benefit.

The EPA's modest reduction is a nod in the direction of market and technological reality. But expect the lobby to fight back ferociously, and it has powerful supporters in Agriculture Secretary Tom Vilsack and GOP Senator Chuck Grassley. Democrats and Republicans who don't bow to Big Ethanol should unite to repeal the mandate for the good of consumers, business and the environment.

Copyright 2013 Dow Jones & Company, Inc. All Rights Reserved
This copy is for your personal, non-commercial use only. Distribution and use of this material are governed by our Subscription Agreement and by copyright law. For non-personal use or to order multiple copies, please contact Dow Jones Reprints at 1-800-843-0008 or visit
www.djreprints.com

The Washington Post

Back to previous page

Ethanol takes policy blow from the Environmental Protection Agency

By Editorial Board, Published: November 17

ONCE TOUTED as a climate-friendly renewable alternative to foreign oil, the corn-based liquid ethanol has been exposed as an environmental and economic mistake. Lured by federal subsidies, Midwestern farmers have devoted millions of acres to corn that might otherwise have been devoted to soil conservation or feed-grain production.

Meanwhile, a "dead zone" fed by fertilizer runoff spreads at the mouth of the Mississippi and production costs throughout the grain-dependent U.S. food industry rise. At the end of 2011, the ethanol industry lost a $6 billion per year tax-credit subsidy. And on Friday the Environmental Protection Agency (EPA) delivered yet another policy defeat for ethanol – which is to say, a victory for common sense.

We refer to the EPA's proposed cut in the amount of ethanol that the nation's refiners must add to the fuel supply in 2014, from 18.15 billion gallons of ethanol called for in current law to a new target of 15 billion to 15.52 billion gallons. The downward revision of roughly 3 billion gallons is the first such reduction since Congress enacted the Renewable Fuel Standard (RFS) in 2007. At the time, gasoline consumption was high and rising, and it seemed reasonable to put the country on course to blend 36 billion gallons of ethanol into motor fuel by 2022, as the RFS statute did.

Changes in motorists' habits, along with advances in fuel economy, have rendered that objective utterly unrealistic. Driving and motor fuel consumption have plateaued. Mixing more and more ethanol into a fixed or shrinking pool of fuel would bump up against the capacity of existing engines to burn it, as well as the capacity of the existing distribution network to pump it. Rather than hit this so-called "blend wall," the EPA wisely decided to scale back the ethanol mandate.

Expect to hear from the ethanol lobby about how this is a victory for their rivals in the Big Oil and Big Grocery lobbies, which it is. The former has no interest in federal subsidization of a rival fuel; the latter would like less competition for access to grain. But that doesn't mean their arguments are without merit. We'd say that in this case, the public benefits do not offset the market distortions. In the case of ethanol subsidies, the benefits do not outweigh the costs.

Indeed, the only flaw we can see in the EPA's announcement is that it doesn't go far enough. Partly, this is because the agency only has authority to waive the current legal requirement for a year; partly it's because "biofuels are a key part of the Obama administration's . . . energy strategy," as EPA Administrator Gina McCarthy put it on Friday. What's really needed is a repeal of the ethanol mandate, which was enacted in a different time, on the basis of projections about energy markets that have not panned out. More efficient fuel-conservation measures, such as a gas-tax increase, would let broad incentives, not politics, determine the best way to move cars and trucks while meeting energy security and environmental goals.

Read more from Opinions: Ryan Cooper: Time to kill the corn ethanol mandate George F. Will: Clunker progressivism

Map Your Flood Risk
Find Floodplan Maps, Facts, FAQs, Your Flood Risk Profile and More!
www.floodsmart.gov

Discounts For Veterans
Veterans Get Computer Discounts With Dell's Purchase Program Today!
www.dell.com/Veterans

360 Savings Account
360 Savings. No fees. No minimums. Nothing standing in your way. Learn More.
www.capitalone360.com

Buy a link here

© The Washington Post Company

AUTO ALLIANCE

DRIVING INNOVATION

STATEMENT

OF

THE ALLIANCE OF AUTOMOBILE MANUFACTURERS

BEFORE THE:

ENERGY AND COMMERCE COMMITTEE
THE SUBCOMMITTEE ON ENERGY AND POWER
U.S. HOUSE OF REPRESENTATIVES

JULY 23, 2013

PRESENTED BY:

Shane Karr
Vice President, Federal Government Affairs

Summary

Auto manufacturers recognize that renewable fuels are an important component in our nation's energy strategy, and Alliance members have long contended that we can make vehicles that can run on virtually any fuel. However, the mere existence of vehicles that can run on a particular fuel or combination of fuels is not enough to make a coherent, successful energy policy.

It is important to recognize that some of the assumptions underlying the RFS when it was enacted in 2007 have turned out to be wrong, and that has created significant implementation challenges. No commercial production of cellulosic biofuels was reported in 2010 and 2011 and only 20,069 gallons were registered as RINs with EPA in 2012. As a result, EPA has waived or proposed waiving most of the original RFS mandates for cellulosic biofuels every year. U.S. gasoline consumption peaked in 2007 and declined to 133 billion gal/yr in 2012. EIA now projects a continued decline to 128 billion gallons by 2020. If even half of FFVs on the road today were being operated on E-85, they would consume a third of current ethanol production. Flawed assumptions have led to flawed policies such as EPA's retroactive E15 fuel waiver for MY 2001 and newer motor vehicles and the push by some for FFV mandates.

If Congress decides to revisit RFS2, automakers are open to prospective policies that reflect a comprehensive commitment to make renewable fuels successful in the marketplace. Such policies would need to address fuel production and distribution equally with vehicles and consumer acceptance. In considering potential new fuels, questions about infrastructure, cost, feasibility, impact on fuel economy and consumer acceptance must be considered. Appropriate cadence between a fuel's availability and vehicles that can run on it is important. In promoting a particular fuel, policy makers must take care not to disadvantage other potentially beneficial technologies.

Above all, automakers need lead-time and certainty to design and develop vehicles that can best meet the multitude of requirements placed on us by regulators, and by consumers.

Testimony

Thank you, Chairman Whitfield, Ranking Member Rush and members of the Subcommittee. The Alliance of Automobile Manufacturers (Alliance) is a trade association of twelve car and light truck manufacturers including BMW Group, Chrysler Group LLC, Ford Motor Company, General Motors Company, Jaguar Land Rover, Mazda, Mercedes-Benz USA, Mitsubishi Motors, Porsche Cars, Toyota, Volkswagen Group and Volvo Cars. Together, Alliance members account for roughly 3 out of every 4 new vehicles sold in the U.S. each year. On behalf of the Alliance, I appreciate the opportunity to offer our views on the Renewable Fuel Standard (RFS) and the role alternative fuels can play in helping address our nation's energy security and environmental concerns. We commend the Committee for its thoughtful and thorough examination of this energy policy.

Auto manufacturers believe that renewable fuels are an important component in our nation's energy strategy, and Alliance members have long contended that we can make vehicles that can run on virtually any fuel. Of course, doing so while still meeting all applicable requirements – including cost and acceptability to our customers – is far more complicated. The mere existence of vehicles that can run on a particular fuel or combination of fuels is not enough to make a coherent, successful energy policy.

The Alliance did not take a position on the volumetric targets or timing for renewables when the RFS2 was being debated in 2007, and we continue to defer to other stakeholders and policy makers who have more expertise with regard to fuel production. However, it is important to recognize that some of the assumptions underlying the RFS2 have turned out to be wrong, and that has created significant implementation challenges. As the Committee studies the RFS2 to determine if reform is necessary, the Alliance is committed to work in a constructive fashion to create certainty regarding our transportation fuel future and implementation from a vehicle and infrastructure point of view.

In 2007, when the RFS2 was significantly expanded as part of the broader Energy Independence and Security Act, policy makers and various stakeholders anticipated significant production of cellulosic biofuels within a relatively short timeframe. RFS2 has a substantial requirement for cellulosic biofuel by capping the volume of corn-starch derived ethanol at 15

billion gallons and increasing the cellulosic biofuel requirements from 100 million gallons in 2010 to 16 billion gallons in 2022. Unfortunately, this market has failed to come into existence on schedule. No commercial production of cellulosic biofuels was reported in 2010 and 2011 and only 20,069 gallons were registered as RINs with EPA in 2012.[1] As a result, EPA has waived or proposed waiving most of the original RFS2 mandates for cellulosic biofuels every year.

Additionally, in 2007, U.S gasoline consumption stood at a record 142 billion gallons per year (gal/yr) and had been growing at an average rate of 1.6% per year for the previous 10 years.[2] In its *Annual Energy Outlook 2007*, the U.S. Energy Information Administration projected gasoline demand to grow to 152 billion gal/yr in 2013 and 168 billion gal/yr in 2020.[3] In fact, U.S. gasoline consumption peaked in 2007 and declined to 133 billion gal/yr in 2012.[4] EIA now projects a continued decline to 128 billion gallons by 2020.[5]

The decline in fuel consumption combined with increasing mandates for corn ethanol would not necessarily have led to the "blend wall" concerns that we are facing now, if not for another flawed assumption – that consumers driving flexible fuel vehicles (FFVs) would use E85 in significant quantities. Automakers believe FFVs are a potentially useful piece of an overall alternative fuel strategy; however, their market penetration has not led to a meaningful uptick in renewable fuel usage. There are over 15 million FFVs on U.S. roads today, yet only about 2 percent of gas stations have an E-85 dispenser, and most are concentrated in the Midwest, where most ethanol is produced. If even half of these vehicles were being operated on E-85, they would consume a third of current ethanol production.

---

[1] 2012 RFS2RFS22 Data (as of June 7, 103) available at http://epa.gov/otaq/fuels/RFS2RFS22data/2012emts.htm.

[2] U.S. Energy Information Administration, "U.S. Product Supplied of Finished Motor Gasoline," March, 2013, http://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=MGFUPUS2&f=A.

[3] U.S. Energy Information Administration, *Annual Energy Outlook 2007*, "Table 1.1. Liquid Fuels Supply and Disposition," http://www.eia.gov/oiaf/archive/aeo07/pdf/aeotab_11.pdf

[4] U.S. Energy Information Administration, "U.S. Product Supplied of Finished Motor Gasoline," March, 2013, http://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=MGFUPUS2&f=A.

[5] U.S. Energy Information Administration, *Annual Energy Outlook 2013*, "Table A11. Liquid Fuels Supply and Disposition," pg. 143.

This shifting landscape is certainly amongst the many drivers fueling the RFS2 debate and continues to create uncertainty for how the policy will be implemented. Biofuel producers and other stakeholders have been forced to think of alternative ways to ensure the RFS2 mandates are met. The Alliance believes this has led to the promotion of flawed policies such as EPA's retroactive E15 fuel waiver for MY 2001 and newer motor vehicles, a flawed pump labeling rule that fails to properly warn consumers away from vehicles not designed for use of E15, and the Open Fuels Standard.

E15 Waivers

The decision to approve the use of E15 for model year (MY) vehicles 2001 and newer is the poster child for policies that were adopted to mitigate the implementation challenges arising from RFS2. The Alliance strongly believes that EPA's decision to approve the use of E15 was made absent critical research and testing results, will likely lead to misfueling and vehicle damage or poor performance; and as a result, may result in a consumer "backlash" against biofuels. Prior to MY 2012, all motor vehicles were designed, certified, and warranted to only withstand up to 10% of ethanol in gasoline; today only two major OEMs produce E15 capable vehicles and all flexible fuel vehicles (FFVs) are able to consume the fuel. Recent studies, including studies conducted by the Coordinating Research Council (CRC), have demonstrated the potential adverse effects of E15 use on certain, post-MY 2001 motor vehicles not designed for such a fuel.

The CRC engine durability study found signs of valve seat wear caused by the mid-level blend (i.e., E15-E20). The CRC fuel system durability study also showed evidence of fuel level sensor errors, fuel pump failures and component swelling caused by the fuel. Recent data also underscored the risk of widespread damage from misfueling other types of engines on E15 as EPA recognized by excluding many products in its partial waivers. During EPA's rulemaking process, automakers and other engine manufacturers consistently urged EPA to wait to make its decision on the introduction of E15 to the nation's fuel market until all of these studies on the potential impacts of E15 on the existing fleet were completed.

The desire to allow more renewable fuels to be blended into the transportation fuel pool cannot be allowed to harm the significant investments made by consumers. We believe that E15

misfueling is unavoidable, particularly in light of the lack of any meaningful measures in place to prevent it. Indeed, EPA concurs in that it has never proposed a misfueling *prevention* plan, only a *mitigation* plan. The only deterrent to E15 misfueling in the mitigation plan is a pump label and it is unlikely that this English-only label would be read and followed by all consumers. EPA so weakened the label's cautionary messaging during the rulemaking process as to render the label essentially ineffective. Motorists focus almost exclusively on price, and inattention can lead to unintentional or inadvertent misfueling of their vehicles, and Clean Air Act violations, even when the passive warnings are provided. As EPA has noted, misfueling with leaded gasoline was widespread even when different nozzle sizes were used in addition to labels.

EPA's final E15 pump label language did not even refer consumers to their vehicle owner manuals for guidance, as the Alliance and others advocated. Automakers want biofuels to succeed in the U.S. and are committed to finding the right market solutions for sustainable biofuel use. If consumer satisfaction is compromised, the credibility of future biofuels and the RFS2 program may be questioned and challenged.

Flexible Fuel Vehicle Mandates

The Open Fuels Standard legislation would effectively require that 50 percent of all light-duty vehicles be FFVs. This is challenging enough – and completely unwarranted – based on the current definition of FFVs as vehicles capable of running on any blend of gasoline and ethanol up to 85 percent (E85). But the proponents of the bill have re-defined what constitutes an FFV – as a vehicle that must be able to run effectively on three fuels – gasoline, E85 and methanol blends up to 85 percent (M85). Insisting that automakers produce vehicles that must accommodate three fuels – of varying energy contents and in any combination – is unworkable. An array of compromises would be needed – at significant cost – to make vehicles capable of using all three fuels. Performance would be sacrificed, durability issues would be enhanced, reliability concerns would be raised, vehicle costs would increase – all to the dissatisfaction of customers and for little to no benefit, since M85 is available nowhere and E85 is available and used very sparingly.

As noted previously, automakers believe the FFV is a worthwhile technology that has a place as part of a broader portfolio of alternative fuel technologies; however, the last six years

have demonstrated that the mere existence of FFVs will not lead to more renewable fuel usage. The primary factors affecting the lack of E85 usage are pricing, availability, total full-tank range, and consumers' willingness to use the fuel. Because ethanol is often priced above its relative energy value (it has less energy than gasoline, so its cost per vehicle mile travelled (VMT) can be higher than comparable VMT cost of gasoline if not priced accordingly), E85 use is not competitive with the use of gasoline. And, because there is little demand for the product, retailers have been slow to install retail sites nationally. Policies to incentivize retailers to offer and price the product competitively and educate consumers on the value of E85 might be effective in promoting more E85 usage, but we should be realistic about potential growth of this market absent a fundamental change in the pricing relationship.

Looking Ahead

If Congress decides to revisit RFS2, automakers are open to prospective policies that reflect a comprehensive commitment to make renewable fuels successful in the marketplace. Such policies would need to address fuel production and distribution equally with vehicles and consumer acceptance, which are really the final link in the chain. In considering potential new fuels, questions about infrastructure, cost, feasibility, impact on fuel economy and consumer acceptance must be considered. Appropriate cadence between a fuel's availability and vehicles that can run on it is important. Such a prospective approach is a far preferable alternative to retroactively introducing fuels into a market that has not been designed, certified or warranted to run on them.

Some key considerations as we move forward include:

Octane Rating Level: Since ethanol provides less energy on a per gallon basis when compared to gasoline, the future fuel may need to provide for a higher octane rating to allow automakers to enhance efficiency and mitigate fuel economy decreases as more ethanol is added to gasoline. Higher octane rated fuels enable automakers to calibrate our engines to improve fuel economy. This change may be crucial for consumer acceptance. It is also critical that automakers are no longer penalized under future regulations for any decreases in fuel economy that are attributable to greater ethanol or lower aromatics use.

Legacy Fuels: Legacy fuels must continue to be available for older vehicles while the refueling infrastructure for higher level ethanol blends is transitioning. Government assistance in implementing an effective program to educate consumers about the fueling capabilities of their vehicles to prevent misfueling will also be crucial to the success of the effort. In addition, enforcement of fuel blend and labeling requirements must be extensively and effectively executed.

Above all, this approach must give automakers the lead-time required and establish the certainty needed to design and develop vehicles that can best meet the multitude of requirements placed on us by regulators, and by consumers. It should also provide certainty for producers, retailers, engine manufacturers and other stakeholders. With certainty about the fuels our vehicles will be using and with sufficient lead time, our engineers can design vehicles that are optimized for that fuel. Ultimately, providing the appropriate mechanisms and policies to allow the industry to deliver better fuel economy, better performance, and more cost-effective compliance with emissions standards will in turn improve the value proposition for our customers.

Finally, Congress must take care to minimize negative side effects of promoting a particular fuel. Several Alliance members are expanding their diesel offerings in the US market, because diesels offer significant fuel economy gains relative to their gasoline counterparts. Our members are very concerned by recent studies[6] indicating that failure to address the blend wall could lead to spikes in diesel fuel prices, which in turn, would drive consumers away from an important technology for reducing our overall dependence on oil.

Thank you for the opportunity to offer our views on the Renewable Fuel Standard and I will be happy to answer any questions.

[6] NERA Economic Consulting, "Economic Impacts Resulting from Implementation of RFS2 Program," October, 2012.

Statement for the Record by
The Association of Equipment Manufacturers
1000 Vermont Ave, NW, Suite 450
Washington, DC 20005
202-898-9064

Environment and Public Works Committee
Oversight Hearing on Domestic Renewable Fuels
Wednesday, December 11 2013

AEM
ASSOCIATION OF
EQUIPMENT MANUFACTURERS

AGRICULTURE
CONSTRUCTION
FORESTRY
MINING
UTILITY

The Association of Equipment Manufacturers (AEM) appreciates the opportunity to submit a statement for the record on the Senate Environment and Public Works Committee's Oversight Hearing on Domestic Renewable Fuels.

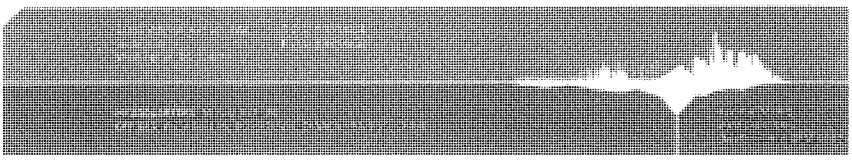
AEM is the U.S.-based international trade group serving the off-road equipment manufacturing industry. AEM members number more than 900 companies that manufacture equipment, products and services used worldwide in the agriculture, construction, forestry, mining and utility fields. Our agricultural equipment manufacturing members are an integral part of the American economy, directly and indirectly employing 370,000 workers, and are optimistic about the market potential represented by the continued development of an advanced biofuels industry.

In the development of the Renewable Fuels Standard (RFS), Congress wisely encouraged the creation of an advanced biofuels industry, namely cellulosic ethanol. Cellulosic ethanol is produced from non-foodstuff plant material and AEM believes the collection of this biomass material represents a significant market for new categories of equipment. Our industry has worked with the Department of Energy and cellulosic producers to develop the best methods for collecting biomass.

The biomass necessary for cellulosic ethanol production will likely be gathered in large square bales as they represent the best feedstock management tool for fuel projects, both agricultural waste collection and energy dedicated crop farming, because of benefits derived from infield storage, ease of transport, reduced size of project fuel yard and handling equipment, reduced trucking costs and better farm management.

Because of the market driving force of the RFS, several advanced biofuels projects are set to begin or ramp up production in 2014. Based on these developments we believe demand for 200 balers will be created next year. This infant market is valued at $25 million. However, if the RFS is left intact, by 2022 we believe this market will grow to 14,000 balers worth $2.1 billon.

Each baler will need shredders and collection wagons along with accompanying tractors to pull them. Furthermore, for the collection of canes and energy crop grasses producers will need modified sugar cane harvesters and swathers/windrowers to operate with the balers. Also 30 percent of the balers will likely be used in combination with a combine. These above equipment needs increase the market potential for our equipment to over $4 billion because of advanced biofuels.



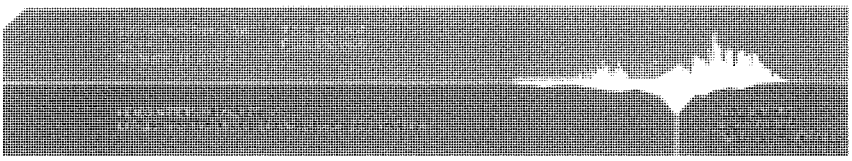
AEM ASSOCIATION OF EQUIPMENT MANUFACTURERS

AGRICULTURE
CONSTRUCTION
FORESTRY
MINING
UTILITY

To position ourselves to take advantage of this coming market opportunity several AEM members are investing considerable resources into R&D to fulfill the specific demands of biomass collection for fuel production. In the appendix we share specific examples of this work.

Our industry is excited about the economic opportunities presented by an advanced biofuels sector which also promises to reduce our nation's dependence on foreign oil while improving the environment. However, we cannot stress enough that, for the moment, the development of this young market is largely dependent on investors' confidence in the RFS staying intact. Tampering now with the RFS will likely cause an exodus of investment capital which could permanently stunt its growth.

Again, AEM appreciates the chance to offer a statement of the record on this important issue. If you have any questions or if AEM can be of any assistance, please contact Nick Tindall, AEM Director of Government Affairs at ntindall@aem.org or 202-701-4287.



AGCO Single pass corn harvester and field waste baler.

CaseIH LB4 Baler

Statement of the

Society of Independent Gasoline Marketers of America (SIGMA)

And the

National Association of Convenience Stores (NACS)

"Oversight Hearing on Domestic Renewable Fuels"
Committee on Environment & Public Works
Subcommittee on Clean Air and Nuclear Safety
U.S. Senate
December 11, 2013

This statement is submitted on behalf of the Society of Independent Gasoline Marketers of America (SIGMA) and the National Association of Convenience Stores (NACS).

Members of SIGMA and NACS represent approximately 80% of retail fuel sales in the United States. As the Committee explores the future of the Renewable Fuel Standard ("RFS" or the "program"), it is important that the retailer's perspective be considered.

NACS and SIGMA do not support the repeal of the RFS, but do recognize that the program unchanged has the potential to cause problems in the market. As a general matter, they believe the Environmental Protection Association's ("EPA's" or the "Agency's") recently proposed rule[1] outlining the 2014 renewable volume obligations ("RVOs") appropriately addresses these potential problems without undermining the principles on which the program is premised – diversifying the fuel supply, increasing the overall fuel supply, encouraging domestic fuel production, and lowering fuel costs for American consumers.

[1] EPA, 2014 Standards for the Renewable Fuel Standard Program, 78 Fed. Reg. 71732 (Nov. 29, 2013).

INTRODUCTION

Overview of SIGMA and NACS

SIGMA represents a diverse membership of approximately 270 independent chain retailers and marketers of motor fuel. Ninety-two percent of SIGMA's members are involved in gasoline retailing, 66 percent are involved in wholesaling, 36 percent transport product, 25 percent have bulk plant operations, and 15 percent operate terminals. Member retail outlets come in many forms, including travel plazas, traditional "gas stations," convenience stores with gas pumps, cardlocks, and unattended public fueling locations. Some members sell gasoline over the Internet, many are involved in fleet cards, and a few are leaders in mobile refueling.

NACS is an international trade association composed of more than 2,200 retail member companies and more than 1,600 supplier companies doing business in nearly 50 countries. The convenience and petroleum retailing industry has become a fixture in American society and a critical component of the nation's economy. In 2012, the convenience store industry employed more than 1.84 million (1.82mm in 2011) workers and generated $700.3 billion in total sales, representing approximately 4.5 percent of the United States' GDP – or one of every 22 dollars spent – in 2012.

The Retailer's Objective

These associations' members' sole objective is to sell what their customers want to buy. As new fuels enter the market, they want to be able to sell those fuels lawfully and with minimal volatility and risk. While agnostic on which liquid fuel they sell to satisfy consumer demand, they do have a bias: They believe it is best for the American consumer and America's industrial position in the world marketplace to have reasonably low and stable priced energy.

SIGMA AND NACS SUPPORT EPA'S PROPOSAL

Adapting to an Evolving Market

Congress last revised the RFS in 2007. Those revisions were premised upon an expectation of (1) a rise in demand for gasoline and (2) widespread availability of cellulosic ethanol by 2013. Neither of those expectations has been met. In 2007, the nation consumed approximately 150 billion gallons of gasoline; demand was

expected to increase at an annual rate of approximately 1.3% through 2030. In reality, consumption in 2013 is projected to be less than 134 billion gallons. Higher corporate average fuel economy ("CAFE") standards combined with a struggling economy have lowered the country's gasoline usage. In addition, the country has not experienced the growth in flex fuel vehicles and sales of E85 (gasoline with a concentration of 85 percent ethanol and 15 percent gasoline) that was anticipated.

Without regard to these unanticipated market realities, the statutory RFS volume targets continue to increase year after year. If left in place, these targets could only be met if more ethanol is blended into every gallon of gasoline.

At the present time, the market is simply unable to blend more ethanol into gasoline. This is true for two related reasons:

Insufficient Demand – More than anything else, the number one trait of any successful retailer is an ability to identify what his or her customers want to buy, and then sell that product. Fuel retailers' customers do not purchase products because members of SIGMA and NACS sell them; members of SIGMA and NACS sell products because their customers purchase them. To date, there are very few retailers that have seen an adequate return on their investment to sell fuel blends greater than E10. Quite the opposite, most retailers that sell E15 or E85 have yet to see substantial sales of these products. Indeed, even consumers with flex-fuel vehicles that are compatible with E85 tend to purchase E10.

It is important to keep in mind that of the various mandates contained in the RFS, there is no mandate for consumers to purchase anything. Unless there is a substantial increase in consumer demand for higher fuel blends, retailers will naturally be reluctant to make the investments that are necessary in order to sell them.

Retailer Liability – Beyond insufficient demand, retailers' liability concerns act as a further disincentive to selling higher fuel blends.

OSHA regulations require retailers to use equipment that has been listed by a nationally recognized testing laboratory as compatible with the fuel the equipment is storing and dispensing.[2] The primary testing laboratory is Underwriters

[2] 29 C.F.R. 1926.152(a)(1) ("Only approved containers and portable tanks shall be used for storage and handling of flammable and combustible liquids." "Approved" is defined at 29 C.F.R. 1910.106(35) ("Approved unless otherwise indicated, approved, or listed by a nationally recognized testing laboratory.")

Laboratories ("UL"). However, prior to 2010 UL had not listed a single dispenser as compatible with any ethanol concentration greater than 10%. Further, given UL's policy, no device listing can be revised. Consequently, retailers who wish to sell any gasoline containing more than 10% ethanol (such as E15 or E85) must acquire a new dispenser that has been listed as compatible with the product. Dispensers can cost upwards of $20,000 and few retailers are willing to dispose of functional and modern dispensers in order to sell a new fuel for which demand is at best uncertain.

Recently, the two primary device manufacturers (Gilbarco and Wayne-GE) have obtained UL listing for retrofit kits for some of their units to upgrade their compatibility to accommodate fuels containing up to 25% ethanol. These units are currently available for $2,000-$4,000 per kit and may be available for more than 50% of the dispensers in the market. This reduces the costs for many retailers, but the expense still equates to nearly 10% of a store's annual pre-tax income – a significant risk given uncertain consumer demand.

Converting dispensers to ensure their compatibility with higher levels of ethanol blended fuel is feasible because one can determine the compatibility of units at a particular location. More complicated is determining the compatibility of underground equipment. Retail fueling facilities can often change hands several times after a tank system is installed, leaving the current owner uncertain of the listing status of underground equipment. This equipment can include the underground storage tank itself, connecting pipes and fittings, submersible equipment and other ancillary units. It is essential that these units be compatible with these new fuels as well. Replacing them, however, is extraordinarily expensive. When a retailer opens the surface of an outlet to address underground equipment issues, costs can quickly exceed $100,000 per location.

Assuming a retailer can confirm or upgrade his equipment to ensure compatibility with these new fuels, there remain other challenges. The rule authorizing the sale of E15 restricts its use to vehicles manufactured after 2001 and prohibits its use in earlier models or small engines.[3] EPA issued a misfueling mitigation rule requiring the placement of dispenser decals near the E15 selector and requiring additional measures, but there are no physical applications available to prevent the consumer from misfueling. Further, it is expected that a sizeable

[3] 40 C.F.R. 80.1504; *see also* EPA, Regulation to Mitigate the Misfueling of Vehicles and Engines With Gasoline Containing Greater Than Ten Volume Percent Ethanol and Modifications to the Reformulated and Conventional Gasoline Programs, 76 Fed. Reg. 44406 (July 25, 2011).

percentage of consumers may not know in what year their vehicles were manufactured.

This puts retailers in a precarious situation. If they offer E15 and a consumer uses that fuel in a non-approved engine, retailers are exposed to the threat of being charged with a violation of the Clean Air Act and subject to fines of up to $37,500 per violation. Even if the retailer is fully compliant with EPA's misfueling mitigation requirements he may be subject to civil litigation under the Act's private right of action provision. Further, because many engine manufacturer owner's manuals and warrantees do not authorize the use of E15, the retailer may be threatened with liability for engine damage or for selling a fuel that voids the consumer's warranty. The simple threat of litigation deters retailers from offering the higher blends.

Blend Wall

Once the RFS's volume obligations exceed the volume of renewable fuel the market can absorb, the market will have hit the so-called "blend wall." The blend wall would undoubtedly lead to a significant increase in the price of fuel, and would inflict substantial harm on the United States economy. This damage would be caused by a shortage of Renewable Identification Numbers ("RINs"), which are used to ensure compliance with the RFS's volume obligations. RINs are essentially an artificial commodity that has become an integral component of manufacturers' ability to produce and import fuel. If the market reaches the blend wall, there will not be enough RINs to allow obligated parties to satisfy their volume obligations under the RFS. This will result in significantly elevated prices for the RINs that are available. For those obligated parties unable to acquire sufficient RINs, they could face fines from the EPA or might make other decisions to lower their obligations under the program by reducing or exporting production. All of these situations will add costs to fuel production and, as happens in every industry, these costs will be passed down to retailers and, ultimately, the costs will be absorbed by consumers.

EPA's Proposal

EPA's proposal wisely takes advantage of its statutory authority to avoid the blend wall and associated economic harm. Specifically, the Agency invoked its waiver authority under section 211(o)(7)(A)(ii) of the Clean Air Act – wherein it can lower annual volume obligations where there is "inadequate domestic supply" – to

bring the 2014 RVOs in line with what it projects the market can reasonably absorb (*i.e.*, to avoid reaching the blend wall).

As discussed above, there are presently significant impediments affecting the ability to distribute, blend, dispense, and consume renewable fuels. The "inadequate supply" waiver authority surely encompasses these scenarios. Indeed, in such situations, there is simply not an adequate supply of renewable fuel that could reasonably enter commerce. EPA therefore rightfully determined that it has authority under section 211(o)(7)(A)(ii) to consider the full range of constraints – including fuel infrastructure and other constraints – that could result in an inadequate supply of renewable fuels to consumers.

Additional Authority

In addition to its waiver authority under section 211(o)(7)(A)(ii), EPA's complimentary waiver authority under 211(o)(7)(A)(i) also offers a sufficient basis for revising the 2014 RVOs. Under this "economic harm" authority, EPA can revise the statutory RVOs when implementation of the requirement would severely harm the economy or the environment of a State, a region, or the United States. Although it is not clear whether EPA believes it has authority under 211(o)(7)(A)(i) to avoid the blend wall, for the reasons outlined below, it is quite clear that it does.

EPA's interpretation of its waiver authority is most fully explored in a 2008 decision denying a waiver request submitted by the State of Texas.[4] This interpretation was reaffirmed in the Agency's 2012 decision denying waiver requests that were submitted by several states.[5]

EPA has generally interpreted the statutory requirement that "implementation of the requirement would severely harm the economy or environment of a State, a region, or the United States"[6] as limiting its waiver authority to situations when "implementation of the RFS program itself [causes] the severe harm,"[7] rather than situations where implementation of the program would significantly *contribute* to severe harm.

[4] 73 Federal Register 47168 (August 13, 2008).
[5] 77 Federal Register 70752 (November 27, 2012).
[6] *Supra* n.2
[7] 73 Fed. Reg. 47171.

The economic harm that would result upon the fuels market reaching the blend wall would be directly caused by the RFS. Unlike previous waiver requests that were predicated upon intervening economic factors (*e.g.*, droughts), the blend wall is an artificial dilemma that emanates solely from the RFS.

EPA's 2008 denial of Texas's waiver request also sets forth three additional factors the Agency will consider:

First, it states that its waiver authority is limited to situations where "there is a generally high degree of confidence that there *will* be severe harm as a result of the implementation of the RFS."[8] The Agency should certainly have a high degree of confidence that if prices at the pump increase substantially – as they will when the market reaches the blend wall – there will be almost immediate consequences on the American economy. Merrill Lynch, for example estimates that every one cent increase in the retail price of gasoline amounts to $1 billion in lost consumer spending.[9] Thus, when the market reaches the blend wall, and demand for RINs continues to outpace supply, and fuel producers' increased operating costs are passed down to consumers through higher prices for fuel, it will substantially detract from consumer spending in many areas of the economy and cause severe economic harm, particularly if it continues unabated for a prolonged period of time.

Second, the "harm" must be to the *economy as a whole* rather than one specific sector of the economy (*e.g.*, the livestock industry).[10] The economic harm that would result upon reaching the blend wall would apply to the entire U.S. economy. The United States is a petroleum-based economy. When the retail price of motor fuel increases, it not only constricts household budgets, but it causes the price of *everything* that is transported or produced using motor fuel to escalate. The harm is not targeted toward a narrow segment of the economy, nor is it offset by those few sectors that benefit financially from higher retail fuel prices. The nation's trade deficit rises, and often a recession is close at hand.[11]

Third, the Agency asserts broad discretion in determining whether to grant an "economic harm" waiver. EPA has cited the provision providing that EPA "may"

---

[8] 73 Fed. Reg. 47171 – 47172 (emphasis added).
[9] *See* Jeff Sommer, Numbers That Sway Markets and Voters, N.Y. Times, Mar. 3, 2012, at BU4, available at http://www.nytimes.com/2012/03/04/your-money/rising-gasoline-prices-could-soon-have-economic-effects.html?pagewanted=all&_r=0.
[10] 73 Fed. Reg. 47172.
[11] Sitty: Gal Sitty, Bound by the Chains of Oil, Refueling Am. Blog (May 20, 2013, 9:28 AM), http://www.fuelfreedom.org/blog/bound-by-the-chains-of-oil/.

waive the RFS volume requirements after finding that implementation of the RFS program would severely harm the economy. When Congress intends non-discretionary action, EPA argues, it typically employs a term like "shall." "Thus, EPA believes Congress intentionally gave EPA discretion in determining whether to grant or deny a waiver request, even in instances where EPA finds that implementation of the program would severely harm the economy ... ."[12]

In formal comments to be submitted in January, SIGMA and NACS will encourage EPA to ground its waiver authority under both the "supply" prong *as well as* the "economic harm" prong of CAA section 211(o)(7)(A).

The Necessity of Avoiding the Blend Wall

EPA recognized that the RVOs set forth in the 2007 law bear no rational relationship to current market conditions. The market simply cannot absorb the quantity of ethanol required without administrative or regulatory changes to existing law. Thus, consistent with the flexibility that Congress granted the Agency, EPA utilized its waiver authority to avoid the blend wall and resulting economic harm. If finalized as proposed, it will have three salutary effects:

First, it will achieve displacement of foreign fuel with domestic fuel without inflicting excessive costs on consumers.

Second, it would relieve the burden of non-compliance from the obligated party community (refiners, importers, and blenders) without making those entities produce less and/or export more fuel, either of which would increase the price at the pump domestically.

Third, it would preserve the benefits of a diverse fuel supply.

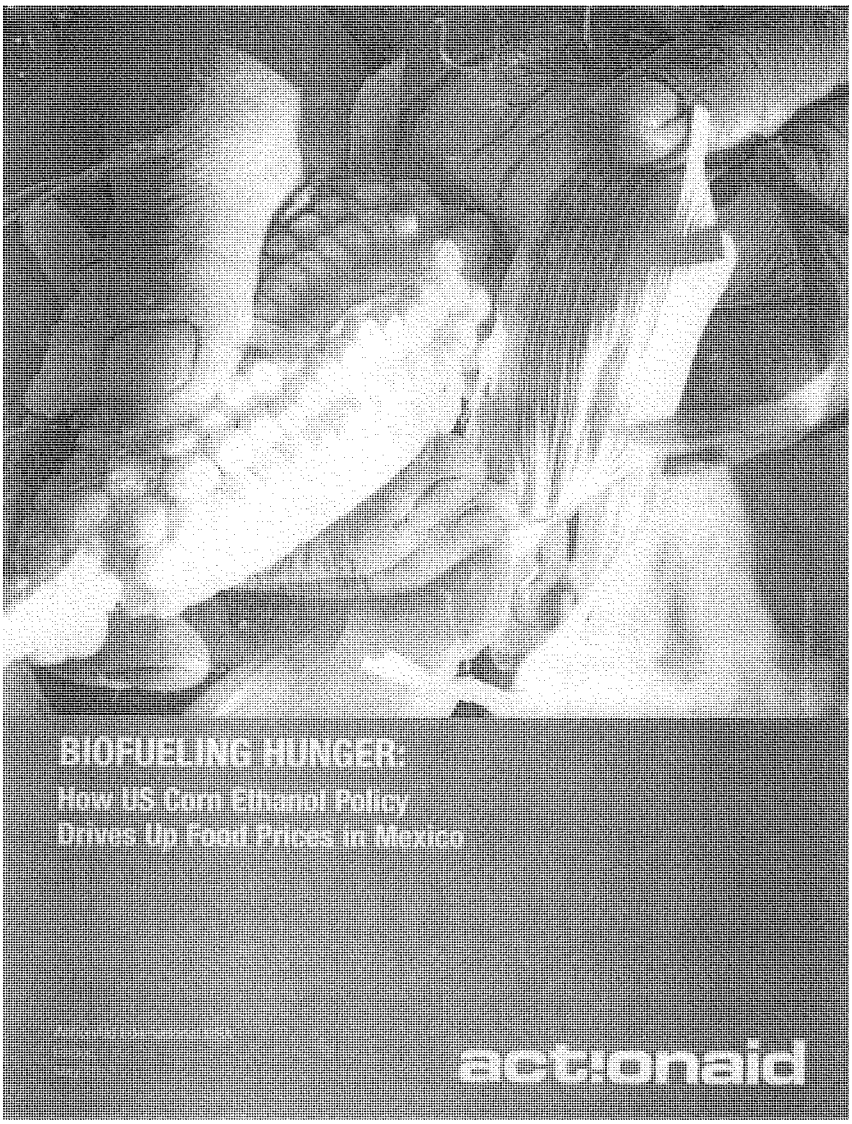
Finally, as policy matter, EPA's waiver authority represents the proper allocation of responsibility, whereby Congress established statutory volume obligations for renewable fuels. The task of setting appropriate annual volume obligations based on the market falls to experts at EPA, who are required to consult with their counterparts at the Departments of Agriculture and Energy. In other words, a waiver to avoid the blend wall is how both the RFS, and the government in general, is supposed to work.

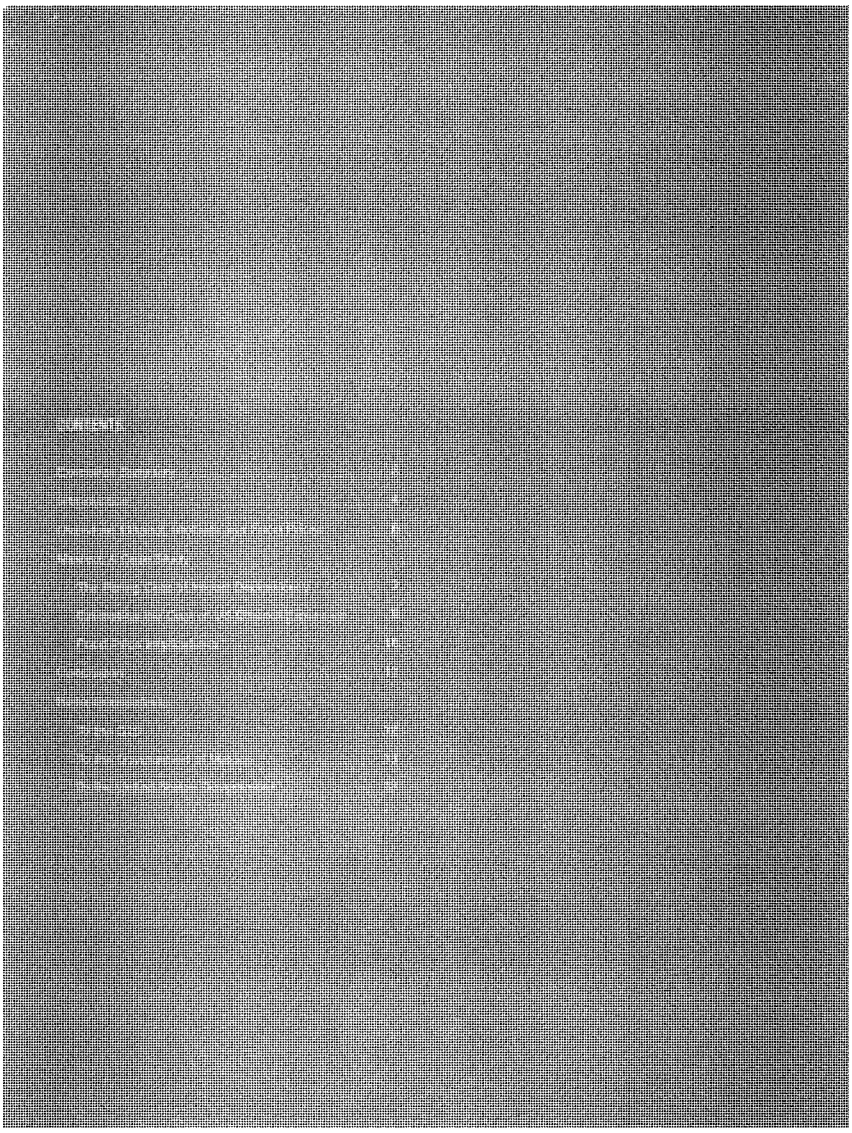
---

[12] *Id.*

CONCLUSION

SIGMA and NACS are grateful for the opportunity to provide this written testimony. Both associations stand ready to be of assistance to the Committec in its consideration of this matter. SIGMA and NACS would be happy to answer any questions the Committee may have regarding this statement.


BIOFUELING HUNGER:
How US Corn Ethanol Policy
Drives Up Food Prices in Mexico
actionaid



EXECUTIVE SUMMARY

Tens of thousands of people marched through the streets of Mexico City when the price of tortillas rose by 25% in late 2006. Mexico's tortilla riots were the first to make international headlines as a global food crisis unfolded in 2007-8. The global crisis ultimately pushed 100 million people into extreme poverty and elevated global food security onto the agenda of world leaders. Now with high prices again in the news, on the eve of the G20 summit in Mexico, are world leaders finally ready to take the steps necessary to tame rising global food prices?

There is widespread agreement among experts that the recent surge in global biofuels production has been an important contributor to the rise in global food prices over the last six years. When staple food crops are diverted to produce fuel, prices rise. These rising prices have in turn hit import-dependent developing countries hard.

In this report, ActionAid looks more closely at one import-dependent country — Mexico — and one crop — corn — to gauge the extent of those impacts. The increase in corn ethanol production in the US has contributed to rising corn prices in several ways. Not only do prices rise when food and feed crops are diverted for use as fuel, but they also increase as land is diverted from other crops to biofuel crops, and as inventories decline. As global corn prices rise, so too do the prices for Mexico's imports and for its own corn production.

We find that rising corn ethanol production in the United States, fueled by a deadly cocktail of subsidies, mandates, and rising oil prices, has increased Mexico's food import bill. In turn, this has pushed up prices for staple foods like tortillas, and increased hunger in Mexico. Specifically, we found that:

- **Since 2005, US ethanol expansion cost Mexico between $1.5 - $3.2 billion[1] in higher corn import prices — or on average between $250-$500 million per year.** This represents 10-20 times the amount Mexico spends annually on its Sustainable Modernization of Traditional Agriculture (MasAgro) support program for small maize and wheat farmers, which the Mexican government highlights as the country's path toward reducing import dependence.[2]

The rise of Mexico's import dependency, in large part due to the North American Free Trade Agreement (NAFTA), has left the country vulnerable to rising US corn prices. Since 1990:

- Mexico's agricultural trade balance swung from a small surplus to a $2.5 billion deficit in 2011;
- Mexico's import bill from the United States soared from $2.6 billion to $18.4 billion in 2011; and
- Mexico's imports of corn went from 7% to 34% in recent years.

The rising price of US corn combined with the increase in Mexico's corn imports has directly impacted Mexican consumers. The price spikes of 2007-2008 hit Mexicans hard, in part because corn tortillas remain the most important staple food in Mexico, particularly for people living in poverty, accounting for an estimated 40% of the calories consumed in the country.[3] Between 2005 and 2011:

- tortilla prices increased by 69%; and
- the cost of the basic food basket that a Mexican family consumes increased by 53%.

Rising corn prices, attributable in part to the increase in US corn ethanol production, are fueling hunger in Mexico. In 2011, 56% of Mexicans suffered some period of food insecurity, and five million children are going hungry.[4]

In 2011, G20 leaders commissioned a report to review the key drivers of food price volatility, and the ten international organizations[5] that authored the study identified biofuels as a key driver — and urged G20 countries to eliminate artificial incentives that encourage biofuels production. The G20 chose to ignore its own report.

With the 2012 Los Cabos summit approaching, the Government of Mexico is in a position to move the

world beyond analysis and towards action on biofuels. Mexico is an excellent case study of how rich country biofuels contribute to rising food prices and import costs. As chair of the G20, the Mexican government can take the lead in putting an end to the biofueling policies of hunger once and for all.

As this report shows, US biofuels policies are costing Mexico dearly, just as similar policies by other G20 members are affecting the world. Mexico should use its position as chair of the G20 to put biofuels policy on the table in Los Cabos.

We are calling on the G20 member countries to:

- Remove artificial incentives that promote biofuels expansion in order to protect food security and reduce food – fuel competition over land resources.
- Address import-dependency that leaves countries vulnerable to food price volatility by investing in small-scale producers, especially women, and in sustainable, agro-ecological farming methods to cultivate staple crops for internal consumption.

Mexico should lead this conversation in the G20 and model this approach by making the following commitments in its own policies. We encourage Mexico to:

- Invest significantly more in small-scale agriculture, with an emphasis on agro-ecological models and women producers, in order to reduce import dependency, protect food security and promote economic development in local communities.
- Demand of its principal trading partners that they adopt biofuels policies that do not increase the cost of basic staple foods.
- Maintain strong biofuels regulation that prohibits the use of corn for fuel and enhances biofuels policies by prohibiting land use changes from food crops to the production of fuel crops.

The US can also be a model for a better balance between food and fuel policy. The US has already abandoned the biggest ethanol subsidy and tariff, but can take the next step by removing volume targets for corn ethanol and reversing the decision to blend greater amounts of ethanol with gas.

INTRODUCTION

The 2008 global food crisis which pushed 100 million people into extreme poverty and sparked riots in over 30 countries around the world was followed all too quickly by another round of rising global food prices in 2010-2011. In late 2010, an additional 44 million people dropped below the extreme poverty line. In 2011 the deadly combination of drought, bad governance, and high food prices gave rise to a famine in the Horn of Africa, and most recently low yields and high food prices have sparked the 2012 food crisis in the Sahel region of West Africa.

There are many causes of increased global food prices and volatility in agricultural commodity markets. In the latest round of food price volatility, climate change, structural changes in commodities markets, food and energy speculation, and longer term trends on both sides of the food supply/demand equation are driving prices up. On the demand side the causes are population growth, rising incomes and affluence, changing diets, and the increasing use of grain for biofuels to supply motor vehicles. On the supply side: soil erosion (exacerbated by climate change), aquifer depletion, loss of cropland to non-farm uses, plateauing crop yields and the growing impacts of climate change are all squeezing supplies, while steadily rising oil prices have increased production, storage and transport costs. A weak dollar, ultra-loose monetary policies, and an explosion of speculative activity on food commodity futures markets are also likely amplifying price movements.[7]

The interaction of these various factors has compounded the problem and pushed prices up, but there are three factors that rise to the top of the food-price challenge.

Climate Change

Extreme and unusual weather in key exporting countries and regions has led to crop failures and production shortfalls and downgrades this year, which have restricted supply and driven up global prices. Scientists at Stanford University estimate that global warming is already cutting substantially into crop yields, with recent models indicating that global corn and wheat production declined by 3.8% and 5.5%, respectively, between 1980 and 2008.[7] It is estimated that climate change adds approximately 8% to the cost of wheat and corn.[8]

Excessive Commodity Speculation

Excessive speculation on food commodity markets is believed to have played a "significant role" in increasing food prices and price volatility during the 2007/8 food price crisis.[9] A special session of commodities experts at FAO in October 2010 concluded that speculation was one of the "main factors" behind the recent escalation in food prices.[10]

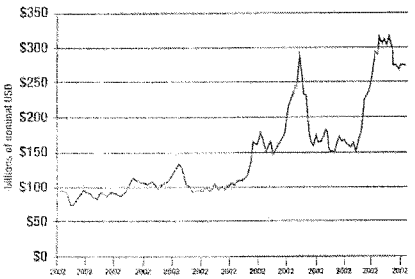
The deregulation of commodity markets in the US allowed a rapid influx of such large sums of money[11] into these relatively small markets, which "accelerated and amplified price movements" in food commodity markets between 2002 and 2008, according to UNCTAD.[12] Holdings in commodity indices jumped remarkably from $13 billion in 2003 to $400 billion in 2011[13], and Barclays Capital estimates that $60 billion was injected into commodities funds alone in 2010 — with much being placed by speculative "momentum investors"[14].

Global Demand for Biofuels

The third factor is the stronger global demand for biofuels. It is this factor on which this report focuses. The food-versus-fuel debate has gained particular urgency in recent years and the diversion of a large and increasing share of US corn to ethanol production has drawn particular attention, and deservedly so. Unlike most other biofuel crops, corn is one of the key staple food crops in the world, the primary source of calories and nutrients for nearly one billion people worldwide. Corn is also one of the most widely used feed crops for animals, so its availability and price have direct impacts on the price of dairy products, eggs, and meat. The United States is at once the world's largest producer and exporter of corn, so what happens to US corn quickly affects prices worldwide.

Encouraged by a set of government policies in the last decade to encourage the production of ethanol, the United States quickly became the world's largest corn ethanol producer, with ethanol elsewhere produced primarily from sugar cane. More than 40% of US corn is now consumed in the production of ethanol, up from just 5% a decade earlier. This represents an estimated 15% of global corn production. This rapid expansion coincided with the global food price crisis, which drove agricultural commodity prices to record highs in 2007-8. The price spikes sparked food riots and political instability in much of the developing world. Prices spiked again in 2010-11. While most agricultural commodity prices have come down from those peaks, corn prices remain stubbornly high (see Figure 1).

FIGURE 1
International Maize Prices
(2000-2012)



Few dispute the importance of biofuels expansion to rising agricultural commodity prices. This occurs on a number of related levels:

- The direct impact as food and feed crops are diverted for use as fuel, as with corn for ethanol.

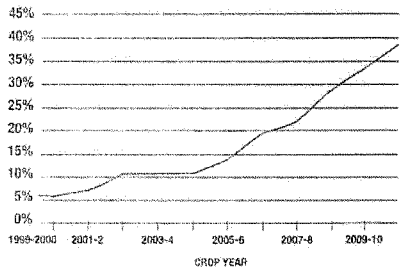
- The scarcities and higher prices resulting from the diversion of land from other crops into the higher-priced biofuel crop, such as soybean land going into corn when corn prices are particularly high, which tends to push up soybean prices.
- The related rises in prices for food crops that can serve as dietary substitutes, as demand for wheat, for example, increases when rice prices increase and demand goes down.
- The rise in the value of agricultural land, for biofuel and food/feed crops. Biofuel expansion contributes to increases in the value of land, creating both practical and speculative incentives to buy up land. The recent wave of "land grabs" in developing countries by resource-poor governments and international financial investors is the most worrisome expression of this trend.
- The strain biofuel demand places on inventories of key food staples. As inventories decline to dangerous levels, as they have in recent years, global markets (and prices) are more vulnerable to both sudden drops in supply (e.g., drought in key exporting country) or unexpected increases in demand (e.g., rising imports after a crop failure in a large importing country). Weather-related crop failures are on the rise, and they are expected to increase in frequency and severity with climate change.
- A rise in speculative buying and selling, which adds to price volatility in tight markets. Large volumes of financial assets have flowed into agricultural commodities markets since the financial crisis hit in 2007. Low inventories, partly due to biofuels, make such speculation more profitable for financial investors who gain from short-term price movements. This adds to price volatility.

It is impossible to isolate the impact of biofuels expansion on all these levels. But a recent report from Tufts University[5] took on a simpler task. Researchers examined the expansion of one particular biofuel — corn ethanol — in one country — the United States — and estimated the resulting impacts on the prices for one crop — corn — and on the import costs for one country — Mexico. The results certainly understate the impacts, but their greater precision gives us a more reliable gauge that has implications well beyond corn and Mexico.

OVERVIEW: ETHANOL, BIOFUELS AND FOOD PRICES

Since 2000, the United States has seen increasingly rapid growth in the amount of corn used to produce ethanol. At 13.8 billion gallons, corn ethanol use today is nearly nine times what it was in 2000, while the share of US corn going to ethanol has risen from 5% to 40% in the last twelve years (see Figure 2). The increases have been particularly sharp since 2004, and they have coincided with recent food price increases.

FIGURE 2
Ethanol Share of US Corn Production



SOURCE: US Department of Agriculture, ERS, Feed Grains.

Ethanol expansion has been encouraged by several government policies, including a protective tariff, a tax credit, and a consumption mandate. The tariff protected the domestic ethanol industry from foreign competition by imposing a $0.54 tax on imported ethanol from non-NAFTA countries, such as sugarcane ethanol from Brazil. Additionally, ethanol benefited from a sizable tax credit, which existed in some form for more than 30 years, and afforded blenders of ethanol a $0.45 tax credit. In 2011, the value of this credit was estimated at $6 billion. On top of this, the industry is supported with the Renewable Fuel Standard (RFS), which developed originally in 2005 and was expanded six-fold in 2007. The 2007 RFS mandates the consumption of an increasing amount of biofuel each year, culminating in 2022 with a 36 billion gallon mandate, at least 15 billion gallons of which can be produced from cornstarch. The remaining gallons are supposed to be filled with so-called "advanced" biofuels, including 16 billion gallons of

cellulosic biofuels, but as that industry continues to be slow to develop, it is unlikely that the United States will be able to fill that mandate by 2022.

Another important policy related to ethanol in the United States is "the blend wall," or how much ethanol can legally be blended into a gallon of gasoline. While at present, the limit is 10% (known as E-10), the EPA has approved a petition to increase this limit to 15% (E-15) and has begun to register producers, making it possible that E-15 could be on the market in some places by the summer of 2012. Because E-15 is not compatible with certain engines, it remains unclear how much this will boost ethanol demand. Other minor forms of support — through loan guarantees, grants and other tax credits — also continue to subsidize the industry.

The US Congress declined to extend the tax credit and tariff at the end of 2011, but the RFS and blending mandate remain, keeping a floor beneath ethanol demand. Corn ethanol expansion could slow in coming years. Most agree that while government policies were key to the rapid expansion of corn ethanol in the United States, high oil prices now make ethanol a competitive substitute for gasoline. But the RFS may well stimulate continued corn ethanol expansion, as would moves toward a 15% blending wall.

Many researchers have attempted to estimate the impact of biofuels expansion on recent increases in food prices, and some have looked specifically at US expansion of corn-based ethanol. A recent report published by the National Academy of Sciences synthesizes the conclusions of eleven studies that examined the 2007 food price spikes, finding a range of 20-40% percent increase in commodity prices as a result of biofuels expansion internationally.[17]

This seems a good characterization of the literature, including studies that incorporate data from more recent years. For example, researchers at Purdue University in two different studies estimated high price impacts from US ethanol policies and expansion, accounting for as much as one-quarter of the large price increases in 2008 and continuing impact since.[18] In terms of impacts on corn prices, a 2009 study attributed 22 percentage points of the 2006-8 price increases to US ethanol expansion.[19]

Much of the range in the estimates relates to the assumed elasticities, the price responsiveness to changes in supply and demand. Lower elasticities lead to higher estimated impacts, as small changes produce large price swings, common for many food crops. For example, researchers used relatively high elasticities to estimate that corn prices in 2007 would have been 12% lower without added demand from corn ethanol, but with lower elasticities the price impacts could have been 25-30%.[20]

Biofuels are projected to continue expanding globally, and so are high food prices. One projection, for example, suggests that corn ethanol trends will push corn prices 12% higher in 2017,[21] while another estimates that with continued biofuel expansion the export price of corn will be 18% higher in 2020 than it would have been without added biofuels demand.[22]

MEXICO: A CASE STUDY

The Rising Cost of Import Dependence

Mexico serves as a useful case study of the costs of rising import dependence in today's high-priced food environment. And because one of Mexico's most important food imports is corn, Mexico also offers an opportunity to examine the ways in which US ethanol expansion contributes to higher food imports. Mexico now imports more than one-third of its corn, overwhelmingly from the United States under the trade liberalization negotiated as part of the North American Free Trade Agreement (NAFTA). Since 1994, when the agreement took effect and trade protections began to be removed, corn, other basic grains, and meats have flowed south from the United States. Meanwhile, Mexico has expanded its exports of fruits and vegetables to its northern neighbor. With the implementation of NAFTA and other complementary economic reforms, Mexico's dependence on corn imports has grown from 7% in the early 1990s to 34% in recent years.[23]

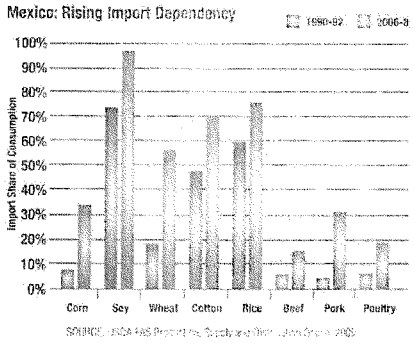
Corn is not the only agricultural product that has seen significant increases in import dependence. Import dependence in five key crops and three meats grew dramatically with the implementation of NAFTA (see Figure 3).

When NAFTA was negotiated, corn and most other agricultural commodities were relatively cheap. In fact,

agricultural commodity prices generally were mired in a decades-long slump, which ended only recently with rising prices in the mid-2000s, followed by sharp spikes in 2006-7 and 2010-11. Before then, importing corn was a relatively inexpensive policy option.

FIGURE 3

Mexico: Rising Import Dependency



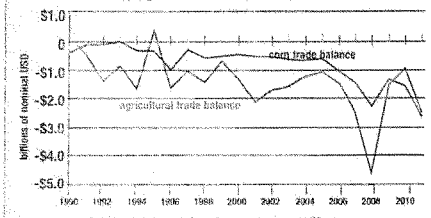
SOURCE: USDA FAS Publication, Distributed from Jason Grant, 2009.

Rising prices changed all that. Mexico's food import bill just from the United States was $2.6 billion in 1990, grew to $6.4 billion in 2000, and by 2011 had jumped to a record $18.4 billion. Even with the rapid increases in Mexico's agricultural exports to the United States, the country's agricultural trade balance worsened, going from a small surplus in 1990 to a deficit of $1.3 billion in 2000, a disastrous $4.6 billion in the food-spike year of 2008, and is still at $2.5 billion in 2011. The costs of corn imports account for a rising share of Mexico's agricultural trade deficit, reaching $2.6 billion in 2011. In the last two years, Mexico's corn import costs accounted for the entire agricultural trade deficit. [See Figure 4.] Under NAFTA, the volume of imports had increased dramatically, and now so had the unit price.

The first price spikes hit Mexicans hard, in part because corn tortillas remain the most important staple in the Mexican diet, particularly for the poor. Though tortillas are made mostly from Mexican-grown white corn and imports are overwhelmingly yellow corn for animal feed and processed foods, rising international prices transmit to the Mexican corn market because white and yellow corn can be substituted in some uses. When imported yellow corn becomes expensive, for example, livestock producers will feed domestically grown white corn to their animals. While there is usually a small price premium for white corn in the Mexican market, prices tend to move in tandem.

FIGURE 4

Mexicos Declining Agriculture & Corn Trade Balance (1990-2011)



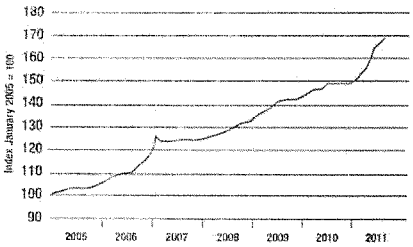
SOURCE: USDA FAS, U.S. Trade Database, In nominal USD billions.

Tortilla prices spiked in 2007 during a wave of panic buying, producing widespread protests in Mexico. These led to government-imposed price controls, which were only partially effective. In nominal terms, the price of tortillas rose 69% from 2005-2011 (See Figure 5.)

While many farmers saw higher prices, a welcome change from the low prices they had received since NAFTA, the impacts on food security were significant. According to Mexican government sources, from 2006-2010, the poverty rate increased from 43% to 49% while the measure of extreme poverty jumped from 14% to 20%. The same agency estimated that 56% of Mexicans suffered some period of food insecurity in 2011, with 11% of the population reporting severe food insecurity.[25]

FIGURE 5

Mexican Tortilla Price Index (2005-2011)



SOURCE: Banco de Mexico, Index of Price of Tortilla, Corrected prices.

Estimating the Cost to Mexico of US Ethanol Expansion

What share of Mexico's rising corn-import bill is the result of US ethanol expansion? As noted earlier, estimates of biofuels' contribution to recent price increases vary considerably. In general, they fall in a range of 20-40%, as the National Academy of Sciences concluded in its survey. The literature suggests that US ethanol is probably the most significant contributor among global biofuels.

To estimate the US ethanol impacts on corn prices, and their subsequent impacts on Mexico's corn import bill, we rely on recent results from a recent Tufts University study, using Bruce Babcock's "backcasting" model.[7] It covers multiple years (through crop-year 2009-10), it examines US corn ethanol in particular, and it estimates price impacts not just of US ethanol policies but separately the impacts of US ethanol expansion since 2004.

As the table shows, Babcock estimates that US corn prices would have been lower if ethanol had not expanded, with the price impacts growing from 2.5% in 2005-6 to 20.9% by 2009-10. The two biggest jumps were in 2006-7 and 2008-9. These percentages are generally consistent with the rising share of US corn going to ethanol. Tufts researchers used Babcock's estimates to extrapolate an additional year based on the assumption that the price impact varies in proportion to the share of corn going to ethanol. (The price estimate for 2010-11 is conservative because the share of corn to ethanol grew slightly in 2010-11, but the price impact is kept constant at 21%.[8])

The researchers calculated how much lower the average price would have been for each crop year if ethanol expansion had stopped at 2004 levels, then multiplied the savings per metric ton by the volume of Mexico's imports for each year. As noted earlier, during this period prices were rising and Mexico's corn imports were high, in part due to the full implementation of NAFTA at the beginning of 2008.[9]

The results in the bottom line of the table show that US ethanol expansion since 2005 cost Mexico about $1.3 billion in higher import bills. If we include preliminary estimates for the first six months of crop-year 2011-12 (September 2011-February 2012), assuming the same ethanol price impact (21%) as in the previous two years, we would add another $254 million to this figure, as corn prices remained high and Mexico's import needs were large due to crop failures in parts of the country. This would bring the total six-and-a-half-year cost of US ethanol expansion to Mexico to $1.5 billion.

Tufts researchers note that this estimate is likely to understate the cost, for a variety of reasons. First, Babcock's estimates of price impacts are on the low end of the 20-40% range suggested in the literature. And his estimates rise to the level of 21% only in 2009-10, while many researchers estimate 20-40% impacts starting as early as 2007-8. Because most of these estimates are for biofuels' contribution to food prices generally, one would expect estimates of the expansion of corn ethanol on corn prices to be among the larger of biofuel impacts.

Costs of U.S. Ethanol Expansion in Mexican Corn Imports, 2005-11

	2005-6 (1)	2006-7 (2)	2007-8 (3)	2008-9 (4)	2009-10 (5)	2010-11 (6)	Total
Average price ($/bushel)	2.00	3.04	4.20	4.06	3.60	5.18	
Price w/o ethanol expansion ($/bushel)	1.95	2.64	3.76	3.30	2.84	4.10	
Difference (percent)	-2.5	-13.3	-10.6	-18.7	-20.9	-20.9	
Difference ($/bushel)	0.05	0.40	0.44	0.76	0.76	1.08	
Difference ($/metric ton)	2.0	15.7	17.3	29.9	29.9	42.6	
Mexico: net corn imports (1000 mt)	11,664	12,267	8,215	7,836	8,314	9,907	58,203
Cost of US ethanol expansion ($ millions)	23	193	142	234	249	422	1,264

Sources: Price from Babcock, "The Impact of U.S. Biofuels Policies on Agricultural Price Levels and Volatility," ICTSD, 2011 [column 6 extrapolated from Babcock]; Mexico net imports: FAS.

Second, these estimates do not take full account of the extent to which US ethanol expansion contributed to price spikes, including from financial speculation, made possible by declining inventories. Corn inventories, in particular, were hard hit by the rapid rise in corn use for ethanol.

Third, McPhail and Babcock have estimated elsewhere that US biofuels policies make corn markets more susceptible to price volatility by reducing the price elasticity of demand for corn and gasoline.[71] Thus, ethanol expansion has an additional indirect effect on prices not captured in our estimates, making corn prices more volatile in the presence of other supply or demand shocks.

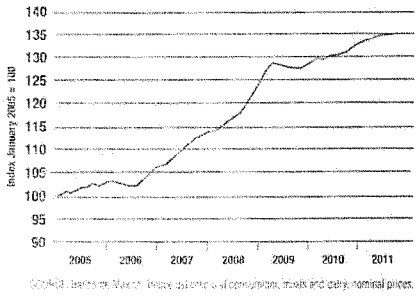
In fact, complex systems scientists from the New England Complex Systems Institute have recently employed a very different methodology to estimate the impacts of both ethanol expansion and financial speculation on corn prices. Drawing on a previously published model that quantifies the contribution of those two factors to overall food price movement in the last six years, researchers scaled the model to corn price movements and the impact on importing countries' costs. For Mexico they estimate that from 2003-4 to 2010-11 US ethanol expansion cost Mexico about $3.2 billion, while financial speculation added another $1.4 billion to the country's seven-year corn import bill. They estimate that US ethanol expansion raised prices and import costs 27% for the entire period, consistent with the range of estimates in the literature. Financial speculation added another 13%, with the largest share coming in 2007-8 when, according to their modeling, financial speculation alone increased prices and import costs by 80%.[72]

Food Price Implications

The most direct impact of higher corn prices is in higher tortilla prices. If ethanol expansion in recent years added 20% to the cost of corn, that would add about 14% to the cost of tortillas.[73] The average Mexican household spends 27% of its income on food; for poor families food can use up half their incomes.[74] According to some estimates, the recent food price increases effectively reduced poor Mexican household's food budgets by 18%,[75] so the food security impacts, just through the corn-tortilla chain, are large.

Corn is also an important input in other foods, most notably meats and dairy products. Mexico's growing industrial livestock industry, particularly for pork and chicken, rely on (mostly imported) corn for feed. Rising feed costs have contributed to rising prices for all animal products. Meat and dairy prices in Mexico rose 35% from 2005 to June 2011 (the latest data available, see Figure 6).

FIGURE 6
Mexican Meat and Dairy Price Index (2005-2011)



Overall, Mexico's "basic food basket" saw increases of 53% from 2005-2012 (March), contributing to rising levels of poverty. This hits the poor, especially women and children, particularly hard. According to government estimates, five million children in Mexico suffer from hunger.[76]

Unlike many import-dependent developing countries, Mexico still grows a lot of corn, so some members of society benefited from higher prices. Mexican corn farmers saw gains from higher prices and from ethanol's contribution to those prices. This reversed a long period of low prices. Elsewhere Wise estimated that from 1997-2005, when corn prices were generally low and when the United States exported corn on average at 19% below its costs of production, US "agricultural dumping" cost Mexican producers $6.5 billion.

For import-dependent countries that no longer grow much of their own food, biofuel-induced price increases are simply a large net loss to society, straining government trade balances, using scarce hard currency, raising food prices for consumers, and driving up the cost of government safety net programs.

The policy goal, of course, is neither high nor low prices, but rather relatively stable prices that are remunerative for farmers and still affordable for consumers. US ethanol expansion has not contributed to achieving that goal, fueling significant increases in prices and contributing to greater price volatility.

Struggles with NAFTA, with GMOs, with migration. We will not give up.

Pedro Jose Gomez Galvez, [illegible] of collective farming in Cuauhtemoc municipality of Chihuahua [illegible] interviewed in May 2011 [illegible] work because the [illegible] imported from the US [illegible] community since 2006.

I was born in the Agua Fria ejido (a form of collective farming) in Cuauhtemoc. I come from a family of peasant farmers originally from the ejido, and we still live here. I joined the peasant movement in the mid-1980s, when I was 25 years old. We were struggling for better prices for corn and beans, in my community, we were also struggling to solve a land tenure problem.

We could tell that the North American Free Trade Agreement (NAFTA) was going to harm small-scale seasonal grain producers and now we can see that it did hurt them. It hurt everything that was small-scale: small-scale merchants, small scale industry, and even those operating at a larger scale, such as medium-sized irrigation farmers and other sectors like dairy products and apples.

With NAFTA completely opened up, we can see that the struggle has been lost. Still, we don't give up. Now we are fighting to protect our corn against the threat of planting and importing Genetically Modified Organisms (GMO).

In the mid-1980s, our ejido was doing very well producing local (criollo) corn and beans, but as time passed, and trade was opened up, these crops have been almost completely abandoned because of the low prices and high yields produced by irrigation farming of hybrid corn. Competition from pinto beans from the United States has also influenced this situation. Now a lot of producers are focusing mainly on oats for fodder and livestock (calves for export) as a secondary activity, since we have extensive summer pastures. The situation has changed a lot over these 25 years. And the fact is that not farming corn and beans anymore is an assault on our food sovereignty and that of the entire country.

Now beans are being produced in just a few regions, where the soil is good for legumes. And criollo corn varieties are still grown in certain municipalities such as Gómez Farías, Madera, and Zaragoza.

Apart from changing the type of production, another consequence of the trade opening in my region, and in Chihuahua in general, is mass migration. There are ejidos, rural communities, where 50% of the residents are gone. You can see it in the censuses. Many schools have shut down and some young people have gotten involved in drug trafficking because there are no opportunities for them. All of this is contributing to the current insecurity.

I am a high school graduate and I work as a technician in the area of livestock. I have three daughters ages 25, 20, and 16, and a son who is 11. We are rural farmers. We do not intend to leave our community.

CONCLUSION: BIOFUELS EXPANSION CONTRIBUTES TO FOOD INSECURITY IN MEXICO

There is widespread agreement that biofuels expansion, with its direct diversion of food and feed crops and its indirect impact through competition for land and other food-producing resources, has been an important contributor to the rise in food prices over the last six years. Most researchers agree that the expansion of US corn ethanol has had particularly strong impacts. This has a deleterious impact on import-dependent developing countries. Here we have looked at one import-dependent country and one crop to gauge the extent of those impacts.

By any standard, $1.5-3.2 billion -- $250-$500 million per year -- in added corn import costs for a country such as Mexico is significant. It represents 10-20 times the amount Mexico spends annually on its MasAgro support program for small maize and wheat farmers. Mexico spends about $1.3 billion a year on its entire agricultural income support program, PROCAMPO.[xi]

Ethanol-related price increases have negative impacts on consumers, particularly food-insecure consumers who are not farming and so do not see any gain from higher corn prices. Corn accounts for roughly 60% of the final cost of tortillas, Mexico's staple, so a 20% increase in corn prices from ethanol, transmitted to the Mexican market for white corn contributes to food insecurity.

RECOMMENDATIONS

With the 2012 Los Cabos summit approaching, Mexico is both an excellent case study of how biofuels contributes to rising food prices – and it is in a key role, as chair of the G20, to lead the effort to put an end to the biofueling of hunger once and for all. The Mexican government, as the current chair of the G20, has identified food security and food price volatility among the key issues it plans to address at this year's summit. But it has yet to propose any action to address the role of biofuels in contributing to rising food prices. As this report shows, biofuels policies by the US are costing Mexico dearly just as similar policies by other G20 members are affecting the world. Mexico should use its position as chair to put biofuels policy on the table in Los Cabos.

To the G20:

G20 member states hold a special responsibility to take coordinated action on issues of food security: they possess the majority of global food reserves and resources, they host the largest commodity exchanges in the world and their agricultural policies play a dominant role in food price formation. ActionAid calls on the G20 leaders to:

- ✓ **Urge member countries to eliminate targets, mandates and financial incentives that encourage the expansion of unsustainable industrial biofuels production.** This recommendation is consistent with the conclusions of the report of ten international organizations commissioned by the G20 in 2011.
  - Member countries should ensure that all biofuels, whether domestically produced or imported, meet strict social and environmental sustainability criteria that ensures that their production and consumption does not compromise food, land and workers rights and that they result in lower net greenhouse gas emissions than fossil fuels when considering the full life-cycle of the agrofuel production process.

Gael in Chiapas, Mexico

- ✓ **Commit to adopt regulations consistent with each other that strengthen markets' regulation and transparency in order to address food price volatility and discourage traders from changing their base of operations in order to evade stricter rules.** G20 countries should consider mechanisms to tame speculation such as:
  - Regulating food commodity derivatives and imposing 'position' limits – the quantity, or proportion of the total market in any one commodity – controlled by any individual investor or group at a given time in all markets
  - Limiting the volume of trades or size of investment by large institutional investors, especially "index funds" (pension funds, endowments, etc.).
  - Standardising and guaranteeing all transactions by mutual agreement including "over the counter" (OTC) trading through their registration and supervision by market regulatory authorities.
- ✓ **Urge member countries and donor nations to invest in small-scale producers as a means to decrease import-dependency and enhance food security.**
  - At the global level, this investment should be through public sector windows like the Global Agriculture and Food Security Program (GAFSP).
  - At the national level, these investments should prioritize small-scale producers, especially women, and agro-ecological models of production in order to help farmers both adapt to and mitigate the impact of climate change.

To the Government of Mexico:

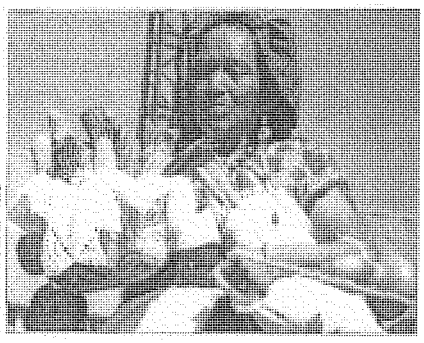
In order to safeguard the right to food in Mexico, the Mexican government should:

- Demand of its principal trading partners that they adopt biofuels policies that do not increase the cost of basic staple foods. US corn ethanol policies have a direct impact on Mexican consumers both through imports and my raising the price of corn on international markets.
- Maintain Mexican biofuel policy to ban the use of corn to make ethanol, and ensure more broadly that land resources are not converted to fuel production. Mexico should also continue to support robust guidelines to ensure that any imported or domestically produced biofuels meet strict social and environmental sustainability criteria.
- Invest in small-scale agriculture, with an emphasis on agro-ecological models and women producers, in order to reduce import dependency, protect food security and promote economic development in local communities.
  - This investment must include the development of infrastructure, access to credit and extension services.
  - Access to land, water and energy is also critical to ensure productivity.
  - Support farmer-to-farmer technology and knowledge sharing in order to help blend the best traditional knowledge and innovation with new technologies to boost productivity while safeguarding natural resources and biodiversity.
- Build transparently governed public strategic buffer stocks of corn, procured from local producers in order to stabilize corn prices in times of volatility.

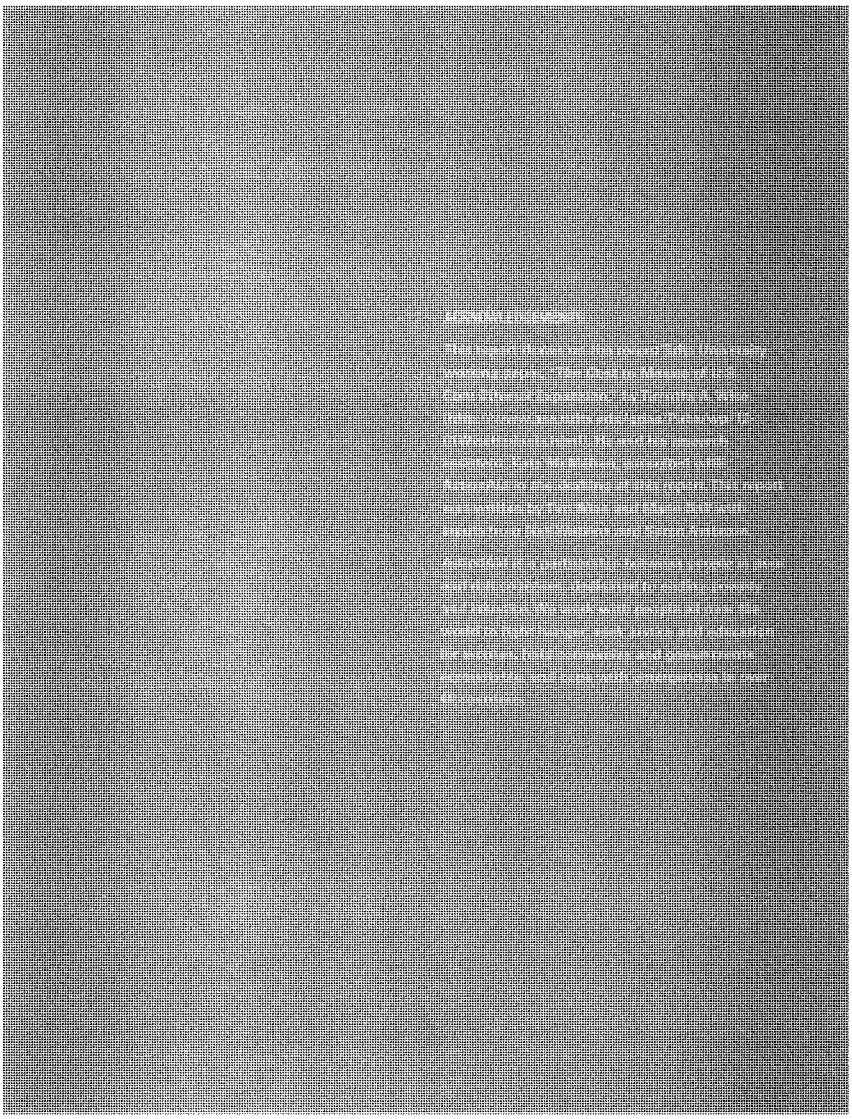
To the Government of the United States:

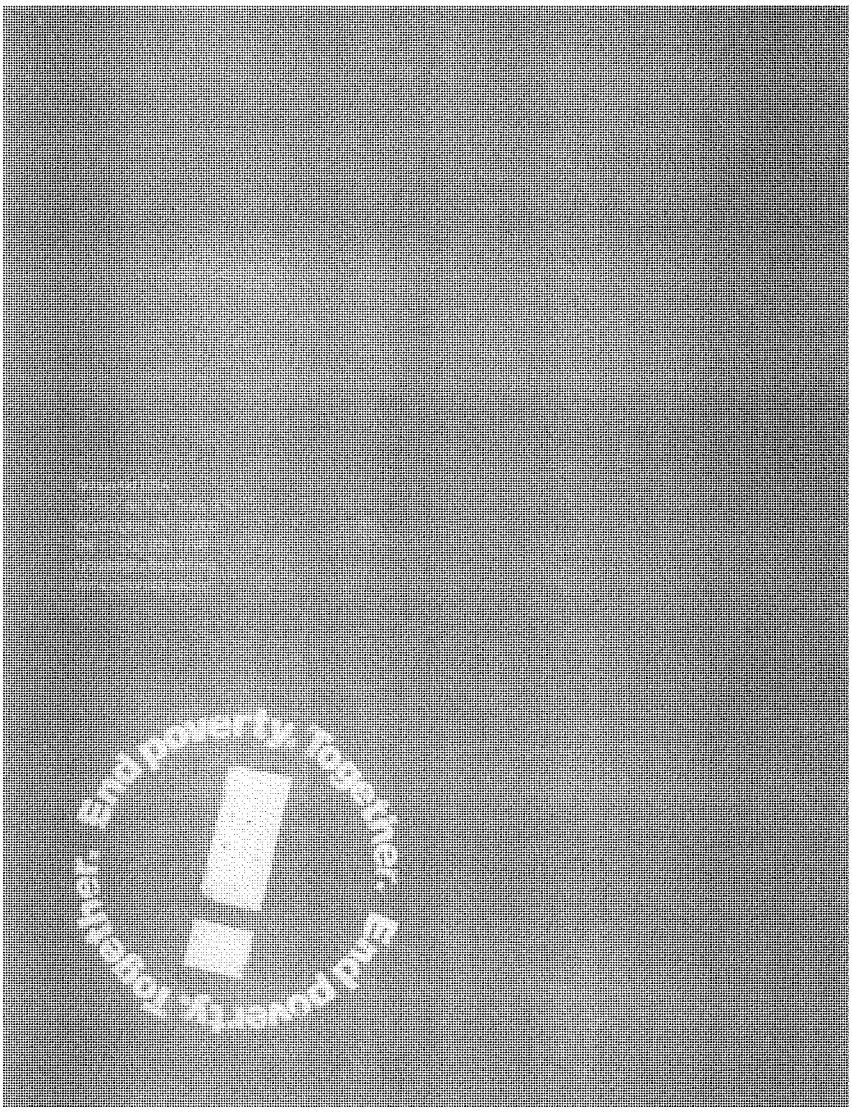
In order to calm food price volatility, and build a better balance between food and energy policies, the United States should:

- Reform the Renewable Fuels Standard to ensure that it does not continue to drive the expansion of corn ethanol or any other food-based fuel.
  - Ultimately, policy makers should remove volume or blending targets of food based fuels to ensure that biofuels policies do not continue to promote food and fuel competition for land and other resources.
  - At minimum, policy makers should support legislation that increases the flexibility of the biofuels mandate, lowering the artificial demand for food based fuels in times of tight supply.
- Put any efforts to expand the amount of ethanol blended in gasoline from E-10-E-15 on hold until an assessment is made on the impact of a new artificial demand for a food-based fuel on global and local food prices, land use and the environment.
- Work to implement the Dodd-Frank Act to curb excessive commodity speculation and fully fund the Commodities Futures Trading Commission in order to ensure the full implementation of the legislation.



Enrique Perez Escobar AMEC




End poverty, preserve, and protect the Republic

CFS 2013/40 REPORT

October 2013

E

COMMITTEE ON WORLD FOOD SECURITY

Fortieth Session
Rome, Italy, 7-11 October 2013
REPORT

I. ORGANIZATIONAL MATTERS

1. The Committee on World Food Security (CFS) held its Fortieth Session from 7 to 11 October 2013 at FAO Headquarters in Rome. The Session was attended by delegates from 121 Members of the Committee; 14 non-Member States of the Committee and by representatives from:

- 11 United Nations Agencies and Bodies;
- 95 Civil society organizations[1];
- 1 International agricultural research organization;
- 2 International and regional financial institutions;
- 47 Private sector associations and private philanthropic foundations[2]; and,
- 26 observers

2. 25 Ministers and 12 Vice Ministers registered. The full list of Members, Participants and Observers is available as document CFS 2013/40/Inf.4 (http://www.fao.org/bodies/cfs/cfs40/en/).

3. The report contains the following annexes: Appendix A - Agenda of the Session; Appendix B - Membership of the Committee; Appendix C - List of documents; Appendix D – Extracts from document CFS 2013/40/10 Rev.1 "Proposed Amendments to the CFS Rules of Procedure and to Rule XXXIII of the General Rules of the Organization".

4. The Committee was informed that the European Union (EU) was participating in accordance with paragraphs 8 and 9 of Article II of the FAO Constitution.

5. The Session was opened by the Chairperson of the Committee, Mr Yaya Olaniran of Nigeria.

6. The Committee adopted the Provisional Agenda and Timetable.

[1] Civil Society's participation was facilitated by the International Food Security and Nutrition Civil Society Mechanism (CSM). This figure includes 74 CSOs under the umbrella of the CSM.
[2] This figure includes 44 companies under the umbrella of the Private Sector Mechanism (PSM).

This document can be accessed using the Quick Response Code on this page;
a FAO initiative to minimize its environmental impact and promote greener communications.
Other documents can be consulted at www.fao.org

mi744e

7. The Committee appointed a Drafting Committee composed of Afghanistan, Algeria, Austria, Brazil, Canada, Côte d'Ivoire, Dominican Republic, India, Lithuania (Presidency of the Council of the European Union), New Zealand, Republic of Korea, Sudan, Switzerland, under the Chairmanship of Mr Lupiño Lazaro (Philippines).

8. Some countries indicated that due to the late availability of documents in some of the official languages of the United Nations, especially those relative to the roundtables, they had not been able to take part in the discussions in said roundtables.

9. The Committee agreed on the overarching need to receive session documents in all United Nations official languages in a timely manner to enable their review by all delegations and urged all responsible for their preparation to ensure that deadlines are duly met.

II. SETTING THE STAGE FOR CFS 40

10. Opening statements were delivered by Mr José Graziano da Silva, Director-General, Food and Agriculture Organization of the United Nations (FAO); Mr Kanayo F. Nwanze, President, International Fund for Agricultural Development (IFAD); Ms Ertharin Cousin, Executive Director, the United Nations World Food Programme (WFP); Mr David Nabarro, Special Representative of the UN Secretary-General on Food Security and Nutrition (on behalf of the UN Secretary-General); Prof. M.S. Swaminathan, Chairperson of the Steering Committee of the High Level Panel of Experts on Food Security and Nutrition (HLPE). The statements are available as CFS information documents at http://www.fao.org/bodies/cfs/cfs40/.

III. THE STATE OF FOOD INSECURITY IN THE WORLD 2013 (SOFI)

11. The Committee considered a presentation of the State of Food Insecurity in the World 2013 (SOFI), entitled "The multiple dimensions of food security", delivered by Mr Pietro Gennari, Director, Statistics Division (ESS) and SOFI Coordinator, FAO, with contributions from the co-authors Mr Thomas Elhaut, Director, Statistics and Studies for Development Division (SSD), IFAD and Ms Joyce Luma, Chief, Food Security Analysis Service, WFP.

12. The Committee was presented with some of the findings of SOFI 2013 report, namely:

i) 842 million people – around one in eight people in the world – are estimated to be suffering from chronic hunger in 2011–13. This figure is lower than the 868 million reported with reference to 2010-2012;
ii) developing regions as a whole have registered significant progress towards the MDG 1 hunger target;
iii) despite overall progress, marked differences across regions persist;
iv) growth can raise incomes and reduce hunger, but higher economic growth may not reach everyone;
v) food security is a complex condition. Its dimensions – availability, access, utilization and stability – are better understood when presented through a suite of indicators;
vi) undernourishment and undernutrition coexist in many countries. However, in some countries, undernutrition rates are considerably higher than the prevalence of undernourishment;
vii) long-term commitment to mainstreaming food security and nutrition in public policies and programmes is key to hunger reduction;
viii) policies aimed at enhancing agricultural productivity, especially for smallholders, combined with social protection policies and programmes, can achieve hunger reduction even where poverty is widespread;
ix) remittances, which have globally become three times larger than official development assistance, have had significant impacts on poverty and food security.

IV. POLICY CONVERGENCE

A. ROUNDTABLE: BIOFUELS AND FOOD SECURITY

13. Mr Mafizur Rahman (Bangladesh), Rapporteur for the Policy Roundtable on "Biofuels and Food Security" presented the topic and the proposed set of recommendations.

14. The Committee:

a) Welcomed the work of the High Level Panel of Experts (HLPE) on Biofuels and Food Security and the relevant report;
b) Recalled the outcomes of the Committee's deliberations on "Food Price Volatility" in October 2011, in particular CFS 37 Final report paragraph 50 i);
c) Highlighted that energy and food security are linked and acknowledged the challenge of achieving both food security and energy security, considering the four dimensions of food security (availability, access, stability and utilization);
d) Took note of the various drivers of biofuel development including energy security, climate change mitigation, export markets development, and rural development;
e) Recognized that biofuel development encompasses both opportunities and risks in economic, social and environmental aspects, depending on context and practices;
f) Underscored that food security and the progressive realization of the right to adequate food in the context of national food security should be priority concerns for all the relevant stakeholders in biofuel development, which should not compromise food security, and should especially consider women and smallholders due to their high level of importance in achieving food security, while considering varied national contexts;
g) Acknowledged that:
   i) The links between biofuels and food security are multiple and complex and can occur in different ways at different geographic levels (local, national, regional, global) and time scales. Therefore, their assessment should be multi-faceted and contextualised, and an integrated, evidence-based, gender-sensitive and environmentally-sound approach is required in biofuel policy-making and investments;
   ii) Production and consumption of biofuels, amongst many other factors, influence international agricultural commodity prices. The interaction between biofuels, food prices and supply responses is dynamic and complex, and requires a distinction between short-term and long-term impacts;
   iii) In some cases, current biofuel production creates competition between biofuel crops and food crops. Significant guidance exists and is further needed to ensure that biofuels policies are coherent with food security to minimize the risks and maximize the opportunities of biofuels in relation to food security. This includes, the CFS Global Strategic Framework for Food Security and Nutrition (GSF); the Voluntary Guidelines on Responsible Governance of Tenure of Land, Fisheries and Forests in the Context of National Food Security (VGGT); the Voluntary Guidelines for the Progressive Realization of the Right to Adequate Food in the Context of National Food Security (RtF); The Global Bioenergy Partnership (GBEP) Sustainability Indicators for Bioenergy and FAO Bioenergy and Food Security (BEFS) Approach.
h) Stressed the importance of concerted international and national actions to encourage that biofuel development and policies are in line with the objective to eradicate hunger, food insecurity and malnutrition, and contribute to sustainable rural development, including respecting legitimate land tenure rights, and poverty reduction, bearing in mind varied national contexts.

15. Encouraged governments to seek coordination of their respective food security and energy security strategies, giving due consideration to the sustainable management of natural resources.

16. Recommended the following action points, their development and implementation, by the appropriate stakeholders.

Actions towards enhanced policy coherence for food security and biofuels

17. Governments, FAO, Agricultural Market Information System (AMIS), GBEP, International Food Policy Research Institute (IFPRI) and other international organizations are encouraged to regularly share with CFS the results of their work on biofuels-food security linkages.

18. Governments, FAO, and all other relevant stakeholders are encouraged to promote and facilitate exchange of information and cooperation on biofuels and food security links. This includes analysis, assessments and projections as well as providing transparent information on assumptions, methods, tools and gender-disaggregated data.

19. Governments and other stakeholders are encouraged to implement policies and investments for the production of biofuels and food in accordance with national development strategies and multilateral agreements applicable to food security. Special attention should also be given to the situation of vulnerable groups and small scale food producers.

20. Governments and other appropriate stakeholders are encouraged to review biofuels policies - where applicable and if necessary - according to balanced science-based assessments of the opportunities and risks they may present for food security, and so that biofuels can be produced according to the three pillars of sustainable development.

21. FAO is invited to inform CFS of the progress made in building capacities in member states with respect to biofuel policies in coherence with food security and initiatives on biofuel policies at multiple levels. This would be based on existing works and material e.g. the GBEP sustainable bioenergy indicators, the FAO BEFS Approach; as well as the VGGT, which governments and all stakeholders are encouraged to promote, make use of and to support their implementation.

22. FAO, in collaboration with relevant stakeholders and in consultation with member states as appropriate, is invited to propose a programme of work aimed at strengthening the capacity of interested countries and operators to assess their situation with regards to biofuels, taking into account food security concerns at global, regional and national levels, legitimate land tenure rights, to manage the related risks and opportunities, and to monitor impacts. This could take advantage of the GBEP capacity building programme.

Actions to promote Research and Development (R&D) on biofuels and food security

23. Food security, smallholder and gender concerns should be integrated as appropriate in the design, monitoring and evaluation of R&D on biofuels. R&D is important in improving the efficiency of biofuels regarding both resources and processes, and in exploring new technologies including biofuels of the second and third generations. Research partners are encouraged to devise solutions adapted to the needs of all stakeholders, especially those in least-developed countries and of women and smallholders who are most in need of access to modern energy services.

24. International cooperation (including south-south cooperation), and public sector, and public-private partnerships have an important role to play in supporting these research topics. It is important to ensure that lessons learned from these partnerships are reflected in future cooperation.

25. R&D, as appropriate, should strengthen capabilities to adapt biofuel production and processing units so that they can modulate their supply chain between food, feed and energy.

Actions with regard to linkages between energy and food security

26. Stakeholders are encouraged to support more energy and other resource use efficiency, increased use of sources of renewable energy and improved access to sustainable energy services, including among others in agri-food chains, according to each country's specificities.

27. Governments and operators should support the participation of farmers, in particular smallholders and women, in food-energy security programmes (including on biofuel production and consumption), as appropriate on the basis of fair and equitable conditions.

28. CFS encouraged public and private sectors to support the integration of sustainable biofuel production into agricultural and forestry policies, according to each country's specificities.

B. INVESTING IN SMALLHOLDER AGRICULTURE FOR FOOD SECURITY AND NUTRITION

29. Ms Florence Buchholzer (European Union), Rapporteur for the Policy Roundtable on "Investing in Smallholder Agriculture for Food Security and Nutrition" presented the topic and the proposed set of recommendations.

30. The Committee:

a) Welcomed the work of the High Level Panel of Experts (HLPE) on "Investing in Smallholder Agriculture for Food Security" and the relevant report, and acknowledged its findings as an important contribution to the CFS recommendations.
b) Recalled the report on the Committee's deliberations on 'How to increase food security and smallholder-sensitive investment in agriculture' during its 37th session in October 2011, particularly the acknowledgement that smallholder farmers, many of whom are women, play a central role for food security locally and worldwide. They are the main investors in their own agriculture. Smallholder agriculture contributes to a range of other benefits such as helping to maintain employment, reduce poverty, and enhance the sustainable management of natural resources.
c) In order to address constraints on investment in smallholder agriculture in general, with special attention to those faced by women and youth, and thereby improve food security and nutrition, the CFS encouraged governments, together with smallholder organizations and other national and international stakeholders (civil society, local organizations, private sector, research institutions and international development partners), to:

Enable national policies, governance and their evidence base:

31. Build or further develop a country-owned vision for smallholder agriculture, in the context of broad-based national, and agricultural development, that positions smallholder agriculture firmly within integrated policies and strategies, that includes connecting smallholders to markets, that is articulated together with all national stakeholders, especially smallholder farmers, of whom women represent a majority in many countries, their organizations and their representatives, in the context of sustainable development and transparent rights-based processes and guidelines.

32. Guided by this vision and the Voluntary Guidelines on the Progressive Realization of the Right to Adequate Food in the Context of National Food Security, consider revisiting agricultural, urban and rural sector policies, strategies and budgets, with particular attention to enabling smallholder access - especially for women - to productive assets, local, national and regional markets, appropriate training, research, technology and farm support services.

33. Support the review, financing and implementation of smallholder inclusive, gender-sensitive, multi-sectoral, policies and strategies linked to sustainable agricultural development, with a particular supporting role by international development partners and especially IFAD, FAO and WFP, the World Bank, bilateral funding agencies and regional development banks.

34. Mainstream gender equality and women's empowerment within the country-led vision and strategy for agricultural development. In addition, encourage gender specific support services in view

of the critical role of women and to address the specific needs and constraints faced by both women and men smallholder farmers.

35. Address constraints to engaging young women and men in smallholder agriculture, as well as in related non-farm rural sectors, through targeted policy interventions. These include strengthening and ensuring equal access to education and training systems.

36. Explore geographically inclusive territorial development as an approach to effectively coordinate cross-sectoral public and private investments, in particular in smallholder agriculture as well as in the non-farm economy.

37. Improve governance for agriculture and rural development through a coordinated multi-sectoral approach, with particular focus on smallholder agriculture, ensuring adequate participation of all relevant organizations, especially those representing smallholder farmers. This involves developing context-specific solutions for smallholder-sensitive public and private investments. Consider experiences such as the Comprehensive African Agricultural Development Programme (CAADP), the Global Agriculture and Food Security Programme (GAFSP) and others.

38. Build inclusive participatory processes that engage smallholders, women, youth, private sector, and other relevant organizations. Promote legal recognition and respect of the rights of smallholder farmers - including the right to organize democratically and to have voice in policy debates, with gender- and age-balanced representation - and the need for farmers' organizations to be strengthened to achieve this.

39. Improve information management (the collection, transparency, communication and access to data, including sex-disaggregated data). Step-up evidence-based analyses to document the state of smallholder agriculture; its diverse typologies, its incentives and constraints, its evolution and its contributions to various outcomes in particular to food security and nutrition.

Promote access to assets, public goods, social services, research and extension and technology

Access to assets

40. Note farmers' and breeders' contribution to conserving and developing plant genetic resources for food and agriculture. Promote smallholders'- particularly women farmers'- ability to access, breed, produce, conserve, purchase, exchange, sell and use the seeds they need, including local, indigenous and modern varieties. Strengthen information and knowledge sharing related to practical on-farm implementation and foster local innovation. Support *in situ* and *ex situ* conservation and development of agricultural biodiversity by smallholders together with research and extension systems, in line with sustainable agricultural development and good practices, including through agro-ecological approaches and sustainable intensification. All the above-mentioned measures of this paragraph have to be in accordance with applicable national and international law.

41. Strongly promote responsible governance of land and natural resources with emphasis on securing access and tenure for smallholders, particularly women, in accordance with the Voluntary Guidelines on Responsible Governance of Tenure of Land, Fisheries and Forests in the Context of National Food Security as well as other country-led measures with similar objectives. Solutions need to be country and context specific and consistent with existing obligations under national and international law. A related need is to strengthen local institutions dealing with regulation of such access and use of natural resources, particularly by smallholders and women.

Access to public goods, social services, research, extension and technology

42. Prioritize public investment and encourage private investment, specifically in support of smallholders' own investments, in, among others; water management, sustainable management of genetic resources for food and agriculture, soil conservation, forests, transport and infrastructure such

as feeder roads, energy, post-harvest handling infrastructure, rural electrification and telecommunication grids.

43. Provide gender-sensitive public investment, and encourage private investments, in health-care, child care, nutrition, education and capacity development, social protection, water and sanitation, to enhance food security and nutrition, and reduce smallholder poverty.

44. Strengthen participatory research, extension and farming service systems, particularly those that respond to the specific needs of smallholders and women farmers, to increase their productivity, diversify their production, and enhance its nutritional value and build their resilience, including with respect to climate change, according to the tenets of sustainable development. The approach is ideally that of combining farmers' and indigenous people's traditional knowledge with the findings of scientific research, as appropriate.

45. Promote access to available technologies that help improve the quality of smallholders' production. Take into consideration the specific constraints of smallholders in relation to sanitary and phyto-sanitary regulations and enable their access to the programs and supplies needed for compliance.

Enable investment, access to markets, productive services and resources

46. ***Promote investment of and for smallholders.*** Improve policies, markets and institutions to foster economic opportunities for smallholders. Mitigate excessive price volatility and non-transferable smallholder risks using public policy instruments in accordance with international commitments. Develop and/or improve value chains and enable smallholders to be full participants in the value chains of their choice. Ensure legal and fair business practices amongst all parties and increase the negotiating capacity of smallholders. This calls for continued development of policy measures and technical guidelines and tools, including for contract farming and public–private partnerships, in consultation with smallholder organizations, the expertise of relevant UN organizations and other centres of expertise.

47. ***Access to markets.*** Support, in accordance with international commitments, the development of, and access to, markets, distribution and marketing systems and mechanisms that are remunerative for smallholders and rural economies. Recognize the importance of non-monetary exchanges of products and services, the importance of local food systems for smallholders including their potential for supplying school and institutional feeding programmes. Create appropriate linkages and engage smallholder farmers, men and women, along value-chains, especially in local, national and regional markets. Enable and stimulate cooperation between smallholders, for instance, via cooperatives or other approaches for market organization that benefit smallholders in accordance with international commitments.

48. ***Financial services.*** Improve regulatory conditions and financial infrastructure to strengthen smallholder access to a full range of financial services adapted to their needs, with attention to the particular challenges faced by women and youth in this regard. Relevant financial services include safe deposits, monetary transactions and remittances, mobile financial services, sustainable micro, short and long-term credit, public insurance schemes (including indexed insurance), commodity exchange and warehouse receipt systems. Reduce financial risks, lower transaction costs and facilitate long-term investments, – such as for field operations equipment, food processing and other value-adding activities on smallholder farms. As appropriate, relax liquidity constraints on working capital expenditures (e.g. fertilizers, seeds) as well as on medium- and long-term investments while avoid worsening smallholder farmers' debt burden. Support such measures by appropriately designed, well-targeted fiscal measures. All the above mentioned measures of this paragraph should be implemented in accordance with international commitments.

49. ***Investing beyond the farm.*** Promote public investment and encourage private investment to develop a decentralised, rural, non-farm economy to support smallholders' access to alternative sources of income, thereby further consolidating the farming economy and contributing to improved

food security and nutrition. This encompasses investment in capacity building and entrepreneurship development, where appropriate and particularly targeting young women and men, for employment in a modernized agriculture as well as in other related activities and labour markets. It also requires promoting investment for new business development.

Furthermore the Committee:

50. Encouraged stakeholders to share their experiences in using these recommendations in their national context at the High-Level Forum on "Connecting Smallholders to Market", planned in the Multi-Year Programme of Work (MYPoW) for 2015. In general, encouraged promoting international cooperation and sharing of experience in smallholder development across the world, with strong engagement and leadership of smallholder organizations.

51. Invited its members and stakeholders to disseminate the findings of the HLPE Report and the present recommendations to relevant fora and processes such as: the implementation of the Voluntary Guidelines on Responsible Governance of Tenure of Land, Fisheries and Forests in the Context of National Food Security and the principles for responsible agricultural investments (rai); the 2014 International Year of Family Farming, the Right-to-Food plus 10, the post-2015 development agenda.

V. CFS WORKSTREAMS

A. PRINCIPLES FOR RESPONSIBLE AGRICULTURAL INVESTMENTS (rai)

52. Ms Christina Blank (Switzerland), Chair of the Open-Ended Working Group (OEWG) on responsible agricultural investments, introduced document CFS 2013/40/6 "Update on the Consultative Process to Develop Principles for responsible agricultural investments in the Context of Food Security and Nutrition".

53. The Committee took note of the update provided in document CFS/2013/40/6 and endorsed the proposed schedule for the way forward as outlined in paragraph 6.

B. ADDRESSING FOOD INSECURITY IN PROTRACTED CRISES SITUATIONS

54. Ms Josephine Wangari Gaita (Kenya), Co-chair of the Open-Ended Working Group (OEWG) on Addressing Food Insecurity in Protracted Crises introduced document CFS 2013/40/7 "Update on the Consultative Process to Develop an Agenda for Action for Addressing Food Insecurity in Protracted Crises Situations".

55. The Committee:

a) expressed satisfaction with the progress made to date in the elaboration of an Agenda for Action for Addressing Food Insecurity in Protracted Crises;
b) appreciated the on-going efforts in addressing the three immediate actions identified as priority areas of work supporting the development of an Agenda for Action;
c) took note of the update provided in document CFS/2013/40/7 and endorsed the schedule proposed for the way forward outlined in paragraph 15.

C. GLOBAL STRATEGIC FRAMEWORK FOR FOOD SECURITY AND NUTRITION

56. The Chair of the Open-Ended Working Group (OEWG) on the Global Strategic Framework for Food Security and Nutrition (GSF), Ms Candice Sakamoto Vianna (Brazil), introduced the documents CFS 2013/40/5 "Process for Updating the Global Strategic Framework for Food Security and Nutrition (GSF)" and CFS 2013/40/5 Add.1, "Global Strategic Framework for Food Security and Nutrition (GSF) – Second Version 2013".

57. The Committee reiterated that the main added value of the GSF is to provide an overarching framework to improve policy convergence and coordination and guide synchronized action by a wide range of stakeholders with practical guidance and core recommendations on food security and nutrition issues.

58. The Committee:

a) endorsed the process for updating the GSF as outlined in document CFS 2013/40/5 Rev.1;
b) endorsed the Second Version of the GSF (2013) that includes the policy recommendations for Social Protection for Food Security and Nutrition and Food Security and Climate Change that were endorsed at CFS 39 in 2012 and encouraged all stakeholders to promote and make use of the Second Version of the GSF (2013) acknowledging its voluntary nature;
c) agreed that the statistical figures included in Section 1 of the GSF should be updated annually to be in line with those of the SOFI reports.

D. RULES OF PROCEDURE

59. The Chair of the Working Group on CFS Rules of Procedure, Mr Guo Handi (China) introduced the document CFS 2013/40/10 "Proposed Amendments to the CFS Rules of Procedure and to Rule XXXIII of the General Rules of the Organization and Outcomes of the Work of the CFS Rules of Procedure Working Group".

60. The Committee expressed its appreciation for the work of the Working Group on CFS Rules of Procedure;

61. The Committee:

a) endorsed the terms of reference, revised qualifications and selection procedure for the new CFS Secretary;
b) endorsed the modalities and requirements for inclusion in the CFS Secretariat, through secondment of staff of other UN entities directly concerned with food security and nutrition;
c) requested FAO, IFAD and WFP to proceed with the process of recruitment of the CFS Secretary as soon as possible.

62. The terms of reference, revised qualifications and selection procedure for the new CFS Secretary and the modalities for inclusion in the CFS Secretariat of other UN entities directly concerned with food security and nutrition are found in Appendix D.

63. The Committee:

a) endorsed the proposed amendment to Rule XXXIII of the General Rules of the Organization (GRO) and requested that the FAO Council, forward these to the Thirty-Ninth Session of the Conference (Rome, 6-13 June 2015) for approval;
b) rejected the proposed amendment to Rule IV (Advisory Group) of the CFS Rules of Procedure. The results of the vote were: 21 votes for, 47 against, and 6 abstentions.

64. The Committee:

a) mandated the Bureau to consider which of the selection criteria for the appointment of Members of the HLPE Steering Committee mentioned in paragraph 43 of the CFS Reform Document and paragraph 10 of the Rules and Procedure of the Work of the HLPE[3], should be included in Rule V of the CFS Rules of Procedure[4] with a view to submitting a proposal to the Committee during its Plenary Session in October 2014;

[3] http://www.fao.org/fileadmin/user_upload/hlpe/hlpe_documents/HLPE_-_Rules_and_procedures.pdf
[4] CFS 2013/40/Inf.15

b) mandated the Bureau in consultation with the Advisory Group to urgently analyze the role of the Advisory Group, its composition, categories and the selection process for each category in order to strengthen its contribution. The Bureau will submit a proposal to the Committee during its Plenary Session in October 2014;
c) mandated the Bureau to further clarify the CFS Reform Document regarding the distinction between CFS Participants and Observers with a view to submitting a proposal to the Committee at its next Plenary Session in October 2014.

E. A FRAMEWORK FOR MONITORING CFS DECISIONS

65. The Chair of the Open-Ended Working Group (OEWG) on Monitoring, Ambassador Mary Mubi (Zimbabwe) introduced the document CFS 2013/40/8 "A Framework for Monitoring CFS Decisions".

66. The Committee:

a) expressed its appreciation for the work of the OEWG on Monitoring;
b) acknowledged document CFS 2013/40/8 as good progress towards a CFS framework for monitoring CFS decisions and recommendations and an important reference for the on-going work of the group. In particular the Committee;
c) underlined the important role of the Committee as a platform for stakeholders to regularly share experiences and practices on monitoring work in strategic areas at all levels (global, regional, national);
d) recognized the importance of CFS monitoring process for improving the CFS effectiveness;
e) endorsed the proposal for a plan of action to disseminate the CFS decisions in the context of the CFS Communication Strategy;
f) endorsed the proposal to focus the CFS monitoring on the Committee's major, strategic and catalytic products;
g) endorsed the conduct of periodic assessments of the CFS effectiveness in improving policy frameworks especially at country level and in promoting participation of and coherence among stakeholders on food security and nutrition. Specifically, it recommended carrying out a baseline survey to assess the current situation as the base of assessing progress;
h) highlighted the need that CFS monitoring mechanisms should build on existing mechanisms at global, regional and national level;
i) requested/recommended that the OEWG on Monitoring continue its work in 2014 and report back to CFS at its 41st Session, subject to available resources;
j) underlined the need to use monitoring and evaluation to improve the work of CFS and the formulation of future CFS recommendations bearing in mind that they should be simple, precise, concise, actionable, and time-bound.

F. PROGRAMME OF WORK AND PRIORITIES AND EMERGING ISSUES

67. The Committee considered document CFS 2013/40/9 Rev.1 "CFS Multi-Year Programme of Work (MYPoW) 2014-2015" as presented by Ms Christine Ton Nu (France), Chair of the Open-Ended Working Group (OEWG) on Programme of Work and Priorities.

68. The Committee:

a) expressed its appreciation for the work of the OEWG and recommended that it continues its work to further prioritize and streamline its programme of work and to implement the proposed process for selection and prioritization of CFS activities in the 2014-2015 biennium;

b) adopted the CFS MYPoW for 2014-2015, including the proposed HLPE report themes, major and other workstreams;
c) adopted the revised Guidance note for selection and prioritization of CFS activities (annexed to the MYPoW);
d) noted that the proposed CFS activities that have not been retained in the 2014-15 MYPoW will be included as part of the background, to be considered along with other inputs in the future process of selection and prioritization.

G. COMMUNICATION STRATEGY FOR THE COMMITTEE ON WORLD FOOD SECURITY

69. The Committee considered document CFS 2013/40/4 "Communication Strategy for the Committee on World Food Security" presented by Ms Cordelia Salter (CFS Secretariat). The Committee:

a) acknowledged that awareness raising and outreach should be an integral part of the development and roll out of all the Committee's work;
b) noted that effective communication is an important component for achieving CFS objectives as awareness regarding CFS and its outputs is a precondition for their voluntary adoption and application taking into account context specificities;
c) endorsed the elements of the strategy as presented and recommended and urged that an implementation plan including the budget be worked out by the Secretariat in close collaboration with the Bureau and the Advisory Group;
d) noted that communication should be an intrinsic part of all CFS workstreams.

VI. COORDINATION AND LINKAGES WITH CFS

70. The objective of this agenda item was to strengthen linkages and encourage a two way dialogue between CFS and other food security and nutrition stakeholders at the global, regional and national levels.

71. This is in line with the three roles of CFS:

- Co-ordination at global level
- Policy convergence
- Support and advice to countries and regions (CFS Reform Document, 2009)

72. The overall theme of the session was:

"Multi-stakeholder Models that Promote Food Security, Nutrition and Sustainable Agriculture: Towards the Post-2015 Development Agenda."

73. CFS encourages the inclusion of all relevant stakeholders in food security and nutrition fora at the global, regional and national levels. The Committee also stresses the importance of multi-stakeholder processes for achieving sustainable agriculture and good nutrition. The experiences, best practices and lessons learned that were showcased in this session are relevant to the implementation of the post-2015 development agenda.

74. The session showcased experiences relevant to CFS engagement in the post-2015 development agenda process, regional initiatives on food and nutrition security and the institutional arrangements to promote national multi-stakeholders efforts on food security and nutrition.

75. Mr David Nabarro, Special Representative of the UN Secretary-General for Food Security and Nutrition, was the Facilitator for the three panel discussions. The Committee welcomed the participation of the panellists in this session.

Global and regional initiatives and linkages with CFS

Global initiatives: Post-2015 Development Agenda

Panellists:

- Ambassador Macharia Kamau, Ambassador and Permanent Representative of the Republic of Kenya to the United Nations in New York and Co-Chair of the Open Working Group on the Sustainable Development Goals
- Ambassador Néstor Osorio, Ambassador and Permanent Representative of Colombia to the United Nations in New York and President of the Economic and Social Council (ECOSOC)
- Louise Kantrow, Permanent Representative to the UN for the International Chamber of Commerce
- Flavio Valente, Secretary General of FIAN International (FoodFirst Information and Action Network) – a member of the Civil Society Mechanism

Regional Initiatives: G8 Alliance for food security and nutrition in the context of CAADP

Panellists:

- Tony Burdon, Head of the Growth and Resilience Department in the UK Department for International Development (DFID)
- Ambassador Yaya Olaniran, Ambassador and Permanent Representative of Nigeria to the Rome-based UN agencies and CFS Chair
- Ruth Rawling, Vice-President for Europe, the Middle East, and Africa for Cargill
- Mamadou Cissokho, Honorable President of the Network of Farmers' and Agricultural Producers' Organizations in West Africa (ROPPA)

Country experiences and lessons learned

Panellists:

- **Brazil – The National Council of Food and Nutrition Security (CONSEA)**
  Maria Emilia Pacheco, President, CONSEA, Brazil
- **Thailand: nutrition impact of agriculture and food systems**
  Kraisid Tontisirin, Professor, Senior Advisor of the Institute of Nutrition, Mahidol University (INMU), Thailand

76. The following views emerged from the discussions:

a) The world has changed since 2000 – future plans and actions for development should be more universal, inclusive and transformative with increasing emphasis on governance, inter-linkages, transparency and accountability.

b) Sustainable agriculture, food security and nutrition are crucial to several agendas such as, poverty alleviation, gender empowerment, youth employment, climate change, energy use, and water management. CFS, as a multi-stakeholder forum where all actors have a space and an opportunity to exchange views, has much to contribute to tackle challenging and controversial issues on food security and nutrition in an open and participatory manner.

c) CFS was encouraged to actively engage in the post-2015 development agenda process, bringing the unique experience of both its multiple- stakeholders and multi stakeholder platform to the debate; and to support the inclusion of a goal reflecting food security and nutrition issues among the sustainable development goals.

d) All stakeholders were encouraged to do their part to ensure that the CFS vision of … a world free from hunger where countries implement the voluntary guidelines for the progressive realization of the right to adequate food in the context of national food security…is adequately reflected in the post-2015 development agenda.

e) Development dialogue at regional and national level should feed into the post-2015 development agenda.
f) Effort is needed to enable greater convergence of different initiatives on food security and nutrition so that they build on and align with regional and country-led efforts.
g) The CFS Bureau and the Advisory Group were encouraged to together explore ways for the CFS to continue the dialogue in the inter-sessional period on specific views expressed during this session.

VII. OTHER MATTERS

A. Election of CFS Chair and Bureau

77. The Committee elected by acclamation Ambassador Gerda Verburg, Permanent Representative of the Kingdom of Netherlands, as the Chair of CFS.

78. The Committee elected by acclamation the following representatives as members and alternate members of the incoming CFS Bureau:

- Members: Afghanistan, Argentina, Australia, Brazil, Congo, France, Pakistan, Philippines, Sudan, Switzerland, Uganda, United States of America
- Alternates: Armenia, Canada, China, Côte d'Ivoire, Ecuador, Indonesia, Italy, Jordan, Mexico, Morocco, Oman, New Zealand.

B. Arrangements for CFS October 2014

79. The Committee recommended that its Forty-first Session be held from 13-17 October 2014 at FAO headquarters in Rome, as indicated on the Provisional Calendar of FAO Governing Bodies. The exact dates will be determined by the Director-General in consultation with the Chairperson of the Committee.

C. Adoption of the Report

80. The report was adopted en bloc on Friday 11 October 2013.

D. Potential engagement of CFS with post-2015 development agenda process

81. The CFS highlights the essential role of food security and nutrition and poverty eradication in the elaboration of the post-2015 development agenda and mandates the Bureau, in consultation with the Advisory Group, to explore ways for the CFS to provide inputs to the decision-making process on the post-2015 development agenda in New York.

APPENDIX A

AGENDA OF THE SESSION

I. ORGANIZATIONAL MATTERS

a) Adoption of Agenda and Timetable
b) Membership of the Committee
c) Drafting Committee composition

II. SETTING THE STAGE FOR CFS 40

d) Statement by the UN Secretary-General (to be confirmed)
e) Statements by Heads of FAO, IFAD, WFP and the Chair of the High-Level Panel of Experts (HLPE) Steering Committee
f) Statement by the CFS Chairperson

III. STATE OF FOOD INSECURITY (SOFI) 2013

IV. POLICY CONVERGENCE

a) Biofuels and Food Security
b) Investing in Smallholder Agriculture for Food Security and Nutrition

V. CFS WORKSTREAMS

a) Principles for responsible agricultural investments (rai)
b) Addressing Food Insecurity in Protracted Crises Situations
c) The Global Strategic Framework for Food Security and Nutrition (GSF)
d) Rules of Procedure
e) A framework for monitoring CFS decisions
f) Programme of Work and Priorities and emerging Issues
g) The CFS communication strategy

VI. COORDINATION AND LINKAGES WITH CFS

VII. OTHER MATTERS

APPENDIX B
MEMBERSHIP OF THE COMMITTEE

Afghanistan
Algeria
Angola
Argentina
Armenia
Australia
Austria
Bangladesh
Belarus
Belgium
Benin
Bolivia (Plurinational State of)
Brazil
Bulgaria
Burkina Faso
Burundi
Cameroon
Canada
Cape Verde
Central African Republic
Chad
Chile
China
Colombia
Congo
Costa Rica
Côte d'Ivoire
Cuba
Cyprus
Czech Republic
Democratic People's Republic of Korea
Denmark
Dominican Republic
Ecuador
Egypt
El Salvador
Equatorial Guinea
Eritrea
Estonia
Ethiopia
European Union (Member Organization)
Finland
France
Gabon
Gambia
Germany
Ghana
Greece
Guatemala
Guinea
Haiti
Honduras
Hungary
Iceland
India
Indonesia
Iran (Islamic Republic of)
Iraq
Ireland
Israel
Italy
Japan
Jordan
Kenya
Kuwait
Lebanon
Lesotho
Liberia
Libya
Lithuania
Luxembourg
Madagascar
Malawi
Malaysia
Mali
Mauritania
Mexico
Morocco
Mozambique
Netherlands
New Zealand
Nicaragua
Niger
Nigeria
Norway
Oman
Pakistan
Panama
Paraguay
Peru
Philippines
Poland
Portugal

Qatar
Republic of Korea
Romania
Russian Federation
San Marino
Saudi Arabia
Senegal
Singapore
Slovakia
Slovenia
South Africa
Spain
Sri Lanka
Sudan
Sweden
Switzerland
Syrian Arab Republic
Thailand
The former Yugoslav Republic of Macedonia
Togo
Turkey
Uganda
Ukraine
United Arab Emirates
United Kingdom
United Republic of Tanzania
United States of America
Uruguay
Venezuela (Bolivarian Republic of)
Yemen
Zambia
Zimbabwe

APPENDIX C
LIST OF DOCUMENTS

Symbol	Title	Agenda Item
CFS 2013/40/1	Provisional Annotated Agenda	I
CFS 2013/40/2	Policy Roundtable: Biofuels and Food Security	IV.a
CFS 2013/40/2 Add.1 Rev.1	Executive Summary of the High-Level Panel of Experts (HLPE) Report on Biofuels and Food Security	IV.a
CFS 2013/40/3	Policy Roundtable: Investing in Smallholder Agriculture for Food Security and Nutrition	IV.b
CFS 2013/40/3 Add.1	Executive Summary of the High-Level Panel of Experts (HLPE) Report on Investing in Smallholder Agriculture for Food Security and Nutrition	IV.b
CFS 2013/40/4	Communication Strategy for the Committee on World Food Security	V.g
CFS 2013/40/5	Process for Updating the Global Strategic Framework for Food Security and Nutrition (GSF)	V.c
CFS 2013/40/5 Add.1	Global Strategic Framework for Food Security and Nutrition (GSF) - Second Version (2013)	V.c
CFS 2013/40/6	Update on the Consultative Process to Develop Principles for Responsible Agricultural Investments (rai) in the Context of Food Security and Nutrition	V.a
CFS 2013/40/7	Update on the Consultative Process to Develop an Agenda for Action for Addressing Food Insecurity in Protracted Crises Situations	V.b
CFS 2013/40/8	A framework for monitoring CFS decisions	V.e
CFS 2013/40/9 Rev.	CFS Multi-Year Programme of Work (MYPoW) 2014-2015	V.f
CFS 2013/40/10	Proposed amendment to the CFS Rules of Procedure and to Rule XXXIII of the General Rules of the Organization and Outcome of the Work of the CFS Rules of Procedure Working Group	V.d
CFS 2013/40/Inf.1	Provisional Timetable	I
CFS 2013/40/Inf.2	List of documents	I
CFS 2013/40/Inf.3	Membership to the Committee on World Food Security	I

CFS 2013/40/Inf.4	List of Delegates, Participants and Observers	I
CFS 2013/40/Inf.5	Statement of competence and voting rights submitted by the European Union	I
CFS 2013/40/Inf.6	Statement by the United Nations Secretary General or his representative	II
CFS 2013/40/Inf.7*	Statement by the Director-General of FAO	II
CFS 2013/40/Inf.8	Statement by the President of IFAD or his representative	II
CFS 2013/40/Inf.9	Statement by the Executive Director of WFP or her representative	II
CFS 2013/40/Inf.10	Statement by the Chairperson of the Steering Committee of the High Level Panel of Experts on Food Security and Nutrition (HLPE)	II
CFS 2013/40/Inf.11	Statement by the CFS Chairperson	II
CFS 2013/40/Inf.12	Coordination and Linkages with CFS - Session Guidelines and Background Information	VI
CFS 2013/40/Inf.13	Following Progress on Decisions and Recommendations of the Committee on World Food Security (CFS)	V.e
CFS 2013/40/Inf.14	Report on CFS Expenditures 2012	V.f
CFS 2013/40/Inf.15	Provisions and decisions regarding the CFS Secretary, Secretariat, Advisory Group and High-Level Panel of Experts on Food Security and Nutrition	V.d

APPENDIX D

EXTRACTS FROM DOCUMENT CFS 2013/40/10/Rev.1 "PROPOSED AMENDMENTS TO THE CFS RULES OF PROCEDURE AND TO RULE XXXIII OF THE GENERAL RULES OF THE ORGANIZATION AND OUTCOMES OF THE WORK OF THE CFS RULES OF PROCEDURE WORKING GROUP"

The CFS Secretary and the inclusion of other UN entities in the CFS Secretariat

1. Selection procedure, including required qualifications and terms of reference

The Bureau, at its meeting on 6 August 2013, reviewed and endorsed the following proposals with a view to present them for endorsement by the Committee at its 40th Session:

a. Terms of Reference for a D1-level CFS Secretary

- Under the overall supervision of the CFS Chair and in close collaboration with the Bureau and the Advisory Group and the Chairs of the working groups as representatives of CFS Members and Participants, the incumbent will:
  a) Manage and supervise the Secretariat;
  b) Manage, report on and be accountable for the CFS budget.
  c) Be responsible for the implementation of the CFS Resource Mobilization Strategy;
  d) Be responsible for the implementation of the CFS Communication Strategy, the communication among CFS stakeholders and the dissemination of CFS publications;
  e) Ensure technical, administrative and logistical support to the CFS Chair and the Chairs of the different working groups and technical teams;
  f) Supervise and provide technical inputs in the preparation of CFS publications, working documents and meetings;
  g) Exercise overall supervision of the CFS Secretariat's support to the High-Level Panel of Experts;
  h) Ensure that the Heads of the three Rome-based agencies are kept informed on the work of the Committee through the appropriate channels;
- The Secretary will be subject to the FAO Regulations and Rules.

b. Qualifications

- The incumbent:
  a) should have professional experience related to the functioning of multilateral and multi-stakeholder processes and their management;
  b) should hold a post-graduate degree preferably in disciplines that are relevant to food security and nutrition;
  c) should have relevant professional experience on food security and nutrition-related issues and policies including preferably a relevant publications record;
- Other details concerning the vacancy announcement for and qualifications of the Secretary, such as managerial, language and other core competences, should be agreed upon by the three Rome-based agencies and communicated to the Committee, through the Bureau and the Advisory Group, in a timely manner.

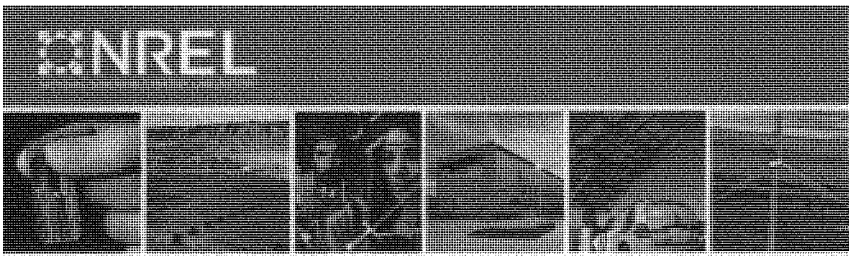
c. Selection Procedure

- The selection process should be transparent and open to any qualified candidate;

- The vacancy announcement will be posted on the FAO, IFAD and WFP websites and publicized elsewhere through other media and by different stakeholders involved in the CFS process;
- The selection panel will be composed of a representative from each of the three Rome-based agencies appointed by the Heads of the organizations;
- The interview process will be in accordance with the standard practices of the three Rome-based agencies;
- The FAO Director-General will appoint the Secretary based on the decision of the selection panel.
- These key elements will represent the basis for the preparation of the vacancy announcement and the implementation of the selection process which are under the responsibility of the three Rome-based agencies.

2. *Inclusion in the Secretariat of other UN entities*

- The Secretary should solicit staff contributions by other UN entities, according to the needs of the Secretariat;
- UN entities directly concerned with food security and nutrition that are interested in seconding one or more of its staff members to the Secretariat could submit an official request and appropriate justification to the CFS Secretary and the CFS Chair who, taking into account CFS workstreams, priorities and needs, will decide whether to invite them to join the team and so inform the Bureau and the Advisory Group;
- Following this decision, the interested UN entity will sign an agreement with FAO according to FAO Regulations and Rules to define the kind of contribution and any other administrative matter.



High Ethanol Fuel Endurance:

A Study of the Effects of Running Gasoline with 15% Ethanol Concentration in Current Production Outboard Four-Stroke Engines and Conventional Two-Stroke Outboard Marine Engines

June 16, 2010 – June 30, 2011

David Hilbert
Mercury Marine
Fond du Lac, Wisconsin

NREL is a national laboratory of the U.S. Department of Energy, Office of Energy Efficiency & Renewable Energy, operated by the Alliance for Sustainable Energy, LLC.

Subcontract Report
NREL/SR-5400-52909
October 2011

Contract No. DE-AC36-08GO28308

High Ethanol Fuel Endurance:

A Study of the Effects of Running Gasoline with 15% Ethanol Concentration in Current Production Outboard Four-Stroke Engines and Conventional Two-Stroke Outboard Marine Engines

June 16, 2010 – June 30, 2011

David Hilbert
Mercury Marine
Fond du Lac, Wisconsin

NREL Technical Monitor: Keith Knoll
Prepared under Subcontract No. NFM-0-40044-01

NREL is a national laboratory of the U.S. Department of Energy, Office of Energy Efficiency & Renewable Energy, operated by the Alliance for Sustainable Energy, LLC.

National Renewable Energy Laboratory
1617 Cole Boulevard
Golden, Colorado 80401
303-275-3000 • www.nrel.gov

Subcontract Report
NREL/SR-5400-52909
October 2011

Contract No. DE-AC36-08GO28308

This publication was reproduced from the best available copy submitted by the subcontractor and received no editorial review at NREL.

NOTICE

This report was prepared as an account of work sponsored by an agency of the United States government. Neither the United States government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States government or any agency thereof.

Available electronically at http://www.osti.gov/bridge

Available for a processing fee to U.S. Department of Energy and its contractors, in paper, from:

U.S. Department of Energy
Office of Scientific and Technical Information
P.O. Box 62
Oak Ridge, TN 37831-0062
phone: 865.576.8401
fax: 865.576.5728
email: mailto:reports@adonis.osti.gov

Available for sale to the public, in paper, from:

U.S. Department of Commerce
National Technical Information Service
5285 Port Royal Road
Springfield, VA 22161
phone: 800.553.6847
fax: 703.605.6900
email: orders@ntis.fedworld.gov
online ordering: http://www.ntis.gov/help/ordermethods.aspx

Cover Photos: (left to right) PIX 16416, PIX 17423, PIX 16560, PIX 17613, PIX 17436, PIX 17721

Printed on paper containing at least 50% wastepaper, including 10% post consumer waste.

High Ethanol Fuel Endurance

A study of the effects of running gasoline with 15% ethanol concentration in current production outboard four-stroke engines and conventional two-stroke outboard marine engines.

Author:
David Hilbert
Thermodynamic Development Engineer

Approved:
Timothy Reid
Director: Engine Design and Development

Mercury Marine
Marine Products and Services

W6250 Pioneer Road
P.O. Box 1939
Fond du Lac, WI 54936-1939 USA
Phone: 920-929-5000
www.mercurymarine.com

Table of Contents

Acknowledgements: 4
Executive Summary 5
Objective: 5
Summary of Results: 5
9.9HP Carbureted Four-Stroke: 5
300HP Four-Stroke Supercharged Verado: 5
200HP EFI 2.5L Two-Stroke: 6
4.3L V6 EFI Four-Stroke Catalyzed Sterndrive: 6
Conclusions and Recommendations: 6
Introduction 7
Project Background: 7
Summary of Marine Engine Considerations: 7
Investigation Details 9
Statement of Problem: 9
Procedure: 9
Test Engine Description: 10
Test Fuel Description: 11
Engine Testing Results 13
9.9HP Four-Stroke: 13
Endurance Test Results 13
Emissions Testing Results 13
Engine Performance Comparison 18
End of Test Teardown and Inspection 22
Verado 300HP Supercharged Four-Stroke: 25
Endurance Test Results 25
Emissions Testing Results 33
Engine Performance Comparison 37
End of Test Teardown and Inspection 40
200 EFI Two-Stroke: 42
Endurance Test Results 42
Emissions Testing Results 43
Engine Performance Comparison 45
End of Test Teardown and Inspection 47
Additional Testing 48
4.3L V6 Catalyzed Sterndrive Emissions Comparison 48
Final Summary 50
Summary of Results: 50
Recommendations: 51
References: 52

List of Tables

Table 1: Test Engine Specifications 11
Table 2: Fuel Analysis Results 11
Table 3: Hardness Measurements on Various 9.9HP Four-Stroke Engine Components 25
Table 4: Verado Exhaust Valve Hardness Measurement Summary 28
Table 5: Hardness Measurements on Various 200HP EFI Two-Stroke Engine Components 47
Table 6: Fuel Flow Comparison on 4.3L V6 Catalyst Sterndrive, EEE vs. E15 49

List of Figures

Figure 1: Power to Weight Comparison, Scatter Band Data Provided by FEV (FEV Motorentechnik GmbH)[1] 8
Figure 2: Example Load Curve Comparison (Automotive data – source 2, boat load data – internal Mercury source) 9
Figure 3: Distillation Curves of Test Fuels 13
Figure 4: 9.9HP Four-Stroke HC+NOx Emissions Results Summary 14
Figure 5: 9.9HP Four-Stroke HC Emissions Results Summary 15
Figure 6: 9.9HP Four-Stroke NOx Emissions Results Summary 15
Figure 7: 9.9HP Four-Stroke CO Emissions Results Summary 16
Figures 8 & 9: Change in Equivalence Ratio vs. Endurance Time-EEE Fuel on E0 engine and E15 Engine 16
Figure 10: Change in Equivalence Ratio vs. Endurance Time-E15 Fuel on E15 Engine 17
Figures 11, 12, and 13: Hydrocarbon Emissions Outputs for Each Emissions Test, E15 Engine on E15 Fuel 18
Figure 14: E0 Engine Power and Torque Output at Endurance Check Intervals 19
Figure 15: E15 Engine Power and Torque Output at Endurance Check Intervals-EEE-E0 Fuel 20
Figure 16: E15 Engine Power and Torque Output at Endurance Check Intervals-E15 Fuel 20
Figure 17: E15 Engine Power and Torque Output, Zero Hour Check-E0-EEE Fuel vs. E15 Fuel 21
Figure 18: E15 Engine-Exhaust Gas Temperature Comparison, Zero Hour Check-E0-EEE Fuel vs. E15 Fuel 22
Figure 19: Piston Undercrown Carbon Deposit Comparison, Cylinder 1, E0 on Left, E15 on Right 23
Figure 20: Small End of Connecting Rod Carbon Deposit Comparison, E0 on Left, E15 on Right 23
Figure 21: Fuel Pump Check Valve Gasket Comparison, E0 on Left, E15 on Right 24
Figure 22: Fuel Pump Check Valve Comparison, E0 on Left, E15 on Right 24
Figure 23: Mineral Deposits in Cooling Jacket, E0 Verado 1B812775A 26
Figure 24: Verado Cylinder Head Indicating Where Head Gasket Failure Occurred, E0 Verado 1B812775A 26
Figure 25: Broken Exhaust Valve from E15 Verado 1B812776, Top Valve in Cylinder 3 27
Figure 26: Cracked Valves from E15 Verado 1B812776, Bottom Valve in Cyl. 3 Left, and Top Valve in Cyl. 6 Right 27
Figure 27: Fatigue Initiation Sites on Cylinder 3 Bottom Exhaust Valve, E15 Verado 1B812776 28
Figure 28: Heat Treatment Test of New Verado Valves 29
Figure 29: Exhaust Valve Failure from Literature Research Showed Similar Failure Mechanism [9] 30
Figure 30: Photo of Section of Cylinder 3, E15 Verado 1B812776, Exhaust Ports on Left 31
Figure 31: Photo of Section of Cylinder 3, E0 Verado 1B812775A, Exhaust Ports on Left 31
Figure 32: Exhaust Valve Lash (Measured Cold) vs. Endurance Time, E0 Substitute Engine 32
Figure 33: Exhaust Valve Lash (Measured Cold) vs. Endurance Time, E15 Engine 33
Figure 34: 300HP Verado HC+NOx Emissions Results Summary 34
Figure 35: 300HP Verado NOx Emissions Results by Mode Point, Representative Zero Hour Test Data 35
Figure 36: 300HP Verado HC Emissions Results by Mode Point, Representative Zero Hour Test Data 36
Figure 37: 300HP Verado CO Emissions Results by Mode Point, Representative Zero Hour Test Data 37
Figure 38: E0 Engine Power and Torque Output at Endurance Check Intervals-EEE-E0 Fuel 38
Figure 39: E15 Engine Power and Torque Output at Endurance Check Intervals-EEE-E0 and E15 Fuel 39
Figure 40: E15 Engine-Exhaust Gas Temperature Change at Wide Open Throttle, EEE-E0 to E15 Fuel 39
Figure 41: Piston Carbon Deposit Comparison, Cylinder 2, E0 on Left, E15 on Right 40
Figure 42: Connecting Rod Carbon Deposit Comparison, Cylinder 2, E0 on Left, E15 on Right 41
Figure 43: Exhaust Cam Lobe Base Circle Detail, Cylinder 3, E0 on Left, E15 on Right 42
Figure 44: 200HP EFI Bearing Failure Pictures 43
Figure 45: 200HP Two-Stroke HC+NOx Emission Results Summary 44
Figure 46: 200HP Two-Stroke CO Emission Results Summary 44
Figure 47: E0 Engine Power and Torque Output at Endurance Check Intervals-EEE-E0 Fuel 45
Figure 48: E15 Engine Power and Torque Output at Endurance Check Intervals-EEE-E0 and E15 Fuel 46
Figure 49: E15 Engine-Exhaust Gas Temperature Change at Wide Open Throttle, EEE-E0 to E15 Fuel 46
Figure 50: Cylinder 2 Wrist Pin Comparison, E0 on Left, E15 on Right 47
Figure 51: Emissions Comparison 4.3L V6 Catalyst Sterndrive, EEE vs. E15 49

Acknowledgements

This report and the work described herein were funded by the American Reinvestment and Recovery Act (ARRA) under stewardship of the Department of Energy (DOE) Office of Energy Efficiency and Renewable Energy (EERE) Vehicle Technologies Program. The technical direction of Kevin Stork (Fuels Technology Team Lead) and Steve Przesmitzki is gratefully acknowledged.

The National Renewable Energy Laboratory (NREL) provided Mercury with the opportunity to perform the work. Keith Knoll was excellent to work with as the Technical Monitor and is given thanks for the collaboration, technical guidance, and most importantly, patience.

The following people at Mercury Marine provided invaluable help with this project: Ed Alyanak, Ken Appleby, Terry Cleary, Mark Degler and the Metlab staff, Mike Docter and the ITC technicians, David Foulkes, Chris Jenks, Orrin Kimble and the engine lab technicians (esp.Ken Lemberger), Brian Merten and the dyno technicians (esp. Keith Hakala), Eric Mueller, Pete Neckuty, Tim Reid, Mark Riechers (program director), and Mike Torgerud.

Executive Summary

Objective:

The objective of this work was to understand the effects of running a 15% ethanol blend on outboard marine engines during 300 hours of wide-open throttle (WOT) endurance – a typical outboard marine engine durability test. For the three engine families evaluated, one test engine each was endurance tested on E15 fuel with emissions tests conducted on both E0 and E15 fuel, while a second control engine was emissions and endurance tested on E0 fuel for each engine family.

Summary of Results:

Results are based on a sample population of one engine per test fuel. As such, these results are not considered statistically significant, but may serve as an indicator of potential issues. More testing would be required to better understand the potential effects of E15.

9.9HP Carbureted Four-Stroke:

- The E15 engine exhibited variability of HC emissions at idle during end-of-endurance emissions tests, which was likely caused by lean misfire.
    - Both the E0 control engine and E15 test engine ran leaner at idle and low speed operation at the end of endurance testing compared with operation at the start of the test.
    - The trend of running lean at idle coupled with the additional enleanment from the E15 fuel caused the E15 engine to have poor run quality (intermittent misfire or partial combustion events) when operated on E15 fuel after 300 hours of endurance.
    - CO emissions were reduced when using E15 fuel due to the leaner operation, as expected for this open-loop controlled engine.
- The E15 engine exhibited reduced hardness on piston surfaces based on post-test teardown analysis.
    - The exhaust gas temperature increased 17°C at wide open throttle as a result of the leaner operation when using E15 fuel. Higher combustion temperatures may have caused observed piston hardness reductions. Lack of pre-test hardness measurements prevented a conclusive assessment.
- Several elastomeric components on the E15 engine showed signs of deterioration compared with the E0 engine.
    - Affected components were exposed to E15 fuel for approximately 2 months; signs of deterioration were evident.

300HP Four-Stroke Supercharged Verado:

- The E15 engine failed 3 exhaust valves close to the end of the endurance test.
    - Metallurgical analysis showed that the valves developed high cycle fatigue cracks due excessive metal temperatures.
- The pistons on the E15 engine showed indications of higher operating temperatures compared to the E0 engine's pistons as evidenced by the visual difference in carbon deposits.
- The E15 engine generated HC+NOx values in excess of the Family Emissions Limit (FEL) when operated on E15 fuel, but did not exceed that limit when operated on E0 emissions certification fuel.

- The primary contributor to this increase in exhaust emissions was NOx due to enleanment caused by the oxygenated fuel.
- CO emissions were reduced when using E15 fuel due to leaner operation, as expected for this open-loop controlled engine.

200HP EFI 2.5L Two-Stroke:

- The 200 EFI two-stroke engine showed no signs of exhaust emissions deterioration differences due to the fuel.
  - The E15 fuel caused the engine to run lean resulting in reduced HC and CO emissions. NOx was of little concern on this type of engine since NOx accounted for less than 2% of the total regulated HC+NOx emissions.
- The E15 engine failed a rod bearing at 256 hours of endurance, which prevented completion of the 300 hour durability test.
  - Root cause of the bearing failure was not determined due to progressive damage.
  - More testing would be necessary to understand the effect of ethanol on oil dispersion and lubrication in two-stroke engines where the fuel and oil move through the crankcase together.

4.3L V6 EFI Four-Stroke Catalyzed Sterndrive:

- Since E15 fuel was readily available in the test facility and an engine equipped with exhaust catalysts was on the dynamometer, emissions tests were conducted on a 4.3L V6 sterndrive engine to better understand the immediate impacts of ethanol on this engine family.
  - At rated speed and load (open-loop fuel control) E15 caused exhaust gas temperatures to increase by 20°C on average and the catalyst temperatures to increase by about 30°C.
  - More rapid aging of the catalyst system occur due to the elevated catalyst temperature when considering the high load duty cycle typically experienced by marine engine applications.

Conclusions and Recommendations:

Several issues were discovered in this study from an exhaust emissions and an engine durability standpoint as a result of running E15 fuel in outboard marine engines. Run quality concerns were also identified as a result of the lean operation on the carbureted engine.

Additional investigation is necessary to more fully understand the observed effects and to extrapolate them to all types of marine engines over broader operating conditions. Effects on operation at part load, transient acceleration/deceleration, cold start, hot restart, and other driveability-related concerns need to be evaluated. This test program was mainly testing for end-of-life durability failures, which would not likely be the first issues experienced by the end users. A customer would likely be affected by run quality/driveability issues or materials compatibility/corrosion issues before durability issues. The wide range of technology used in marine engines due to the wide range of engine output will complicate this issue (Mercury Marine produces engines from 2.5HP-1350HP).

More testing is needed to understand how ethanol blends affect lubrication systems in two-stroke engines that have fuel and oil moving through the crankcase together. Crankcase oil dispersion is the only mechanism by which two-stroke engines of this architecture provide lubrication at critical interfaces such as bearings and cylinder walls. Ethanol may have an effect on the dispersion or lubricity of the oil.

A better understanding of how long term storage affects ethanol blends in marine fuel systems would require more real-world testing. Marine vessels often go through long periods of storage that could affect the fuel systems given the fact that the ethanol portion can absorb water when exposed, especially in humid areas near saltwater.

Introduction

Project Background:

This project was a cooperative effort to assess the feasibility for marine engines of increasing the allowable ethanol concentration in gasoline above the current legal limit of 10%. Specifically, a 15% ethanol / 85% gasoline fuel blend (E15) was tested in current production and legacy outboard marine engines. Gaseous exhaust emissions and engine durability were assessed on a typical durability test cycle. Three separate engine families were evaluated. A 200HP EFI two-stroke engine was chosen to represent legacy product. A 9.9HP carbureted four-stroke engine and a 300HP supercharged EFI four-stroke engine represented current product. Two engines were tested from each family. One was operated on E15 fuel and the other was operated on E0 gasoline. Emissions data from each engine were obtained before, in the middle of, and after durability testing.

Summary of Marine Engine Considerations:

Marine engines require unique considerations when altering the fuel supplied to operate the engine. Considering these engines are frequently used in remote locations (offshore fishing for example), it is critical to ensure that the fuel does not cause or contribute to an engine malfunction. Changes in fuel formulations and the resulting effects on marine engine operability are of high importance.

Outboard marine engines span a large range of rated power output and technology which yields significant complexity when trying to understand the effects of changing the fuel supplied to the engine. When all of the typical Mercury production engines and the Mercury Racing products are included (inboards and outboards), engines from 86cc, 2.5HP up to 9.1L 1350HP twin turbo configurations are produced. Mercury outboards (the focus of this study) range in output and design from the 2.5HP splash lubricated carbureted four-stroke engines to 350HP supercharged EFI four-stroke and 300HP direct fuel injected two-stroke engines. If sterndrive/inboard engines are considered, the technology list gets even broader. The non-racing sterndrive products range from 135HP carbureted 4 stroke to 430HP closed-loop catalyzed EFI 4 stroke with onboard diagnostics. The sales volumes of marine engines may be much smaller than automotive or small offroad utility engines, but the range of power (nearly 3 orders of magnitude) and the range of available technology of marine engines is much wider than these other categories individually.

The marine application requires an engine that has high power density and remains durable at high speeds and loads. It is important to minimize the amount of weight added to the vessel from the powertrain to maximize the payload and minimize drag. Boat hull drag is considerable at typical boat operating speeds resulting in high engine speeds and loads for extended periods. The result of these factors leads to engines which are high performance and made from premium materials. Changing the fuel specification must be carefully considered to assure that durability is not sacrificed. Figure 1 illustrates the power density of the Verado engine (the 300HP supercharged EFI engine family used in this study) compared to automotive engines that were contemporary when the Verado engine was introduced for the 2005 model year. Figure 2 shows a relative comparison of the vehicle load curves of a boat with a planing hull to an automobile. The likelihood of experiencing problems as a result of extended operation at or near WOT are far more pronounced on a marine engine than an automotive engine due to the great difference in vehicle load curves.

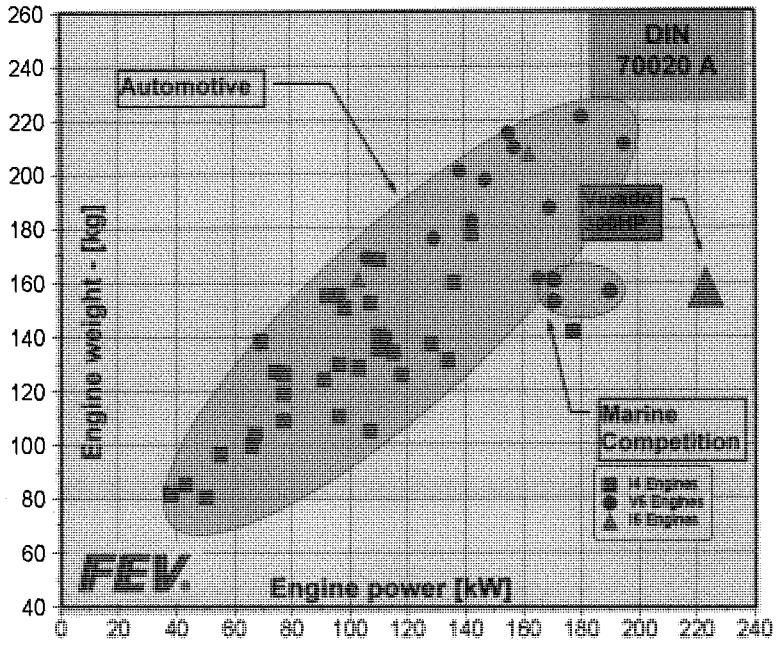


Figure 1: Power to Weight Comparison, Scatter Band Data Provided by FEV (FEV Motorentechnik GmbH)[1]

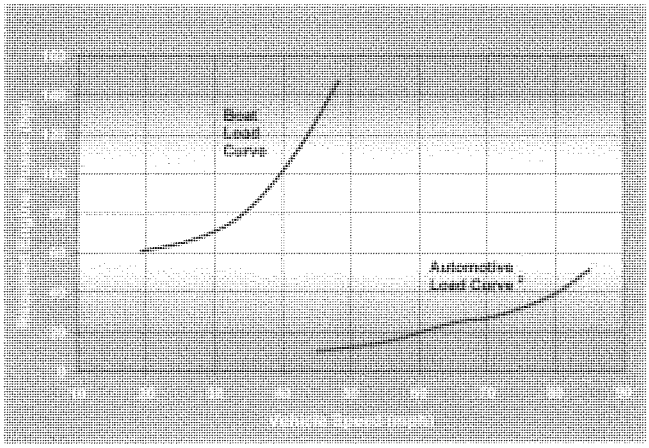


Figure 2: Example Load Curve Comparison (Automotive data – source 2, boat load data – internal Mercury source)

Investigation Details

Statement of Problem:

Procedure:

The engine testing process began by preparing each engine. This included instrumentation of the test engines as well as performing some basic checks (varied by engine type). The instrumentation process included installation of an exhaust emissions probe that met the requirements of the EPA 40 CFR Part 91 regulations.

Each engine was rigged onto an appropriate dynamometer and a break-in process was performed. The break-in consisted of increasing speed and load settings for approximately 2.5 hours total duration and was performed on E0 gasoline for all engines. This was followed by a power run to determine the wide open throttle (WOT) performance of each engine. The power run was performed on E0 gasoline on all engines and also on E15 fuel for only the E15 test engines. The power run included speed points from 2000RPM up to the maximum rated speed of the engine.

Once the WOT performance was checked, emissions testing was performed using reference-grade E0 gasoline (EEE fuel: EPA Tier II emissions reference grade fuel). The emissions tests were done in triplicate to check repeatability and were run in accordance with the EPA requirements set forth in 40 CFR Part 91. Emissions tests were also performed on the E15 engines in triplicate using the E15 test fuel. Although this E15 test fuel was not blended from the reference-grade E0 gasoline, these tests provide some comparison of exhaust emissions between E0 and E15 while minimizing engine-to-engine variability.

Following the above emissions checks, each engine was prepared for the durability testing. This included doing a basic visual inspection as well as some general engine power cylinder integrity checks (example: compression test and cylinder leak-down). These integrity checks were also repeated at the durability mid-point and end-of-life test point as well.

The first half of the durability test was then performed. Each engine was rigged in Mercury's Indoor Test Center, which consisted of large endurance test tanks, air supply systems, and data acquisition systems. Each engine was fitted with the appropriate propeller to operate the engine approximately in the midpoint of the rated speed range at wide open

throttle. The engine instrumentation was continuously monitored and the data was recorded for the duration of the endurance test. Operational shutdown limits were placed on critical channels (min/max engine speed, max coolant temperature, etc) to monitor the health of the engine for the entire durability test period. Periodic maintenance was performed on each engine (as appropriate for the engine type: oil level checks and changes, accessory drive belts, etc). This maintenance was performed in an accelerated manner as compared with typical customer maintenance intervals since the durability testing causes accelerated wear as compared with typical customer use. These protocols are typical of those used by Mercury for any durability test.

Once the first half of the durability testing was completed, each engine was rigged on the dynamometer again. Emissions tests on the appropriate fuel(s) were performed according to the procedures described above. The tests were again performed in triplicate to be able to evaluate repeatability. Each engine also got a visual inspection and the general engine power cylinder integrity checks before being returned to durability testing.

After the midpoint emissions testing was completed, each engine was returned to the Indoor Test Center endurance tank to complete the second half of the durability testing. The testing was performed in the same manner as the first half of the durability portion.

When the durability testing was complete, each engine was returned to the dynamometer for post-durability emissions tests on the appropriate fuel(s). A post-endurance WOT performance power run was also performed to compare with the pre-durability power run.

Finally, after all running-engine tests were completed, each test engine underwent a complete tear-down/disassembly and inspection. This inspection included checks and measurements to assess the degree of wear, corrosion issues, cracks, etc. on power cylinder components. Emphasis was placed on components that would be at risk due to the differences in the fuels (exhaust valves due to exhaust gas temperature differences, for example).

Test Engine Description:

The engines used for this testing were all built as new engines on the production line and were randomly selected. They were not specially built or hand-picked. The choice of engine families to include in this program was based on representing a wide range of technology, a wide range of power output, and a significant annual production volume. The final engine family selection was approved by the Technical Monitor at NREL. Two 4-stroke engine families were selected to represent current production engines. A two-stroke engine family was selected to represent "legacy" products. Table 1 summarizes each test engine configuration.

The 9.9HP four-stroke engine is used on a wide range of applications from small fishing boats, inflatable boats, and as a "kicker" engine. A "kicker" engine is an auxiliary engine used for low speed boat maneuvering while fishing on a large boat which includes a larger engine (150+HP) for the main propulsion. The 9.9HP engine is considered a portable engine. It was selected for this testing due to high sales volume and the fact that it represents the typical architecture for many of Mercury's small carbureted four-stroke offerings. It should be noted that the settings for the carburetors on both of the 9.9HP test engines were set and sealed at the carburetor manufacturer. They were not tampered with by any Mercury personnel and were run just as they would if they were used by the end customer. The only adjustment allowed was the idle throttle stop to set the idle speed, which is the only adjustment a customer has access to.

The Verado engine is considered the "flagship" outboard product at Mercury Marine. The non-Racing version used in this study is available in power outputs ranging from 200-300HP. These engines are used on boats with single, dual, triple, and even quad engine installations ranging from multi-engine offshore fishing boats & US Coast Guard patrol boats, high speed bass boats, all the way to commercial fishing vessels and ferry boats. The supercharged 300HP Verado was selected for testing due to the high performance nature of its design and the demands of this market segment. The Verado engines had an open loop electronic fuel injection system with no user adjustment possible.

The 200HP EFI two-stroke engine represents the "legacy" two-stroke products. The 2.5L platform has been the basis for carbureted, crankcase fuel injected (which is the case for the test engines used), and direct cylinder injection models. The platform has roots that can be traced back to the 1970's. This engine was selected for testing because of the large number of engines that have been built off of this platform over the last several decades and that it represents the typical architecture for a variety of Mercury's two-stroke product. An engine configuration with an EFI fuel system was selected to improve consistency in testing. The 2.5L 200HP EFI engine had an open loop electronic fuel injection system with no user adjustment possible.

Table 1: Test Engine Specifications

Engine Family	9.9HP Four-Stroke	Verado	200HP EFI
Gas Exchange Process	Four-Stroke	Four-Stroke	Two-Stroke
Power Rating at Prop	9.9HP	300HP	200HP
Cylinder Configuration	Inline 2 Cylinder	Inline 6 Cylinder	60 Degree V-6 Cylinder
Displacement	0.209 Liter	2.59 Liter	2.51 Liter
Fuel Induction System	Single Carburetor w/Accelerator Circuit, 2 Valve per Cylinder, Single Overhead Cam	Supercharged Electronic Fuel Injected 4 Valve per Cylinder, Dual Overhead Cam, Electronic Boost Control, Electronic Knock Abatement Strategy	Electronic Fuel Injected with Oil Injection, Loop Scavenged Porting, Crankcase Reed Induction, Electronic Knock Abatement Strategy
Dry Weight	108 lbs / 49 kg	635 lbs / 288 kg	425 lbs / 193 kg
Fuel Octane Requirement	87 Octane R+M/2 Minimum Required	92 Octane R+M/2 Recommended, 87 Octane R+M/2 Minimum Required	87 Octane R+M/2 Minimum Required

Test Fuel Description:

The fuels used in the endurance testing were intended to be representative of typical pump-grade fuels that could be commonly available to the general consumer. The primary factors in sourcing the E15 test fuel were consistency of fuel properties for the duration of testing, consistency of ethanol content at 15%, octane performance that met specific requirements for each test engine, and a representative distillation curve to match charge preparation characteristics. The E15 test fuel was splash blended by our fuel supplier in one batch to ensure consistency throughout testing. The E0 and E15 endurance fuels were sourced from different suppliers; as such there were likely differences in the additive packages (including the concentration of additives) of the fuels. Since the primary duty cycle was wide open throttle endurance, the additive package differences likely had little influence on the test. Since the Verado engine had a premium fuel recommendation, the E15 fuel was blended at a target of 91 octane [R+M]/2. The blend stock used was a typical pump-grade fuel that the supplier used for retail distribution. The E0 fuels used for the endurance testing were also typical pump-grade fuels that the fuel supplier had available for distribution. Both a Regular (87 octane [R+M]/2) and a Premium (91 octane [R+M]/2) fuel supply were maintained at Mercury for testing on this program and all other internal Mercury test programs. The emissions tests on E0 fuel were all performed using EPA Tier II EEE fuel sourced from specialty fuel manufacturer Johann Haltermann Ltd.

Samples of several of the test fuels were sent to outside laboratories for analysis. The parameters that were considered were: the distillation curve (ASTM D86)[3], Research and Motor Octane (ASTM D2699[4] and D2700[5]), density, and API gravity. In addition, NREL measured ethanol content via the Grabner IROX 2000 Gasoline Analyzer and ASTM D5501[6] for the E15 fuel. The Grabner IROX 2000 measures ethanol via infrared spectroscopy (per ASTM 5845[7]) and is valid in the range of 0 – 25% ethanol. The ASTM 5501[6] method uses gas chromatography and is only valid for high levels of ethanol (93% to 97% ethanol); it was used here only as a reference. In-house fuel samples were also taken and analyzed on the Petrospec GS-1000 analyzer. This analyzer was used to estimate the octane and measure the oxygenate concentration. Like NREL's Grabner IROX 2000, the Petrospec GS-1000 operates on the infrared spectroscopy concept and determines the ethanol concentration (up to 15%) per ASTM D5845[7]. The results from the Petrospec machine were used as reference values only, primarily for quality control.

Table 2 shows the various measurements made on the test fuels from the different measurement laboratories. The majority of the parameters were within expected ranges for the tolerance of the measurements used. The ASTM D5501[6] procedure used at NREL showed that the ethanol concentration was 18%. The results from the 2 infrared

spectroscopy measurements from both NREL and Mercury showed concentrations of approximately 14%. The results from the 2 methods bracket the target concentration of 15%, which was the actual concentration that the fuel was blended to at the fuel supplier. Only one sample of E15 was analyzed, which was valid since all of the E15 fuel was blended in one batch. The data sets from the 87 octane bulk/pump fuel and the 91 octane bulk/pump fuel used on endurance, and the data from the EEE were from one load of fuel of the multiple loads of fuel of each type used during the duration of the testing.

Table 2: Fuel Analysis Results

Fuel Analysis		E15 Fuel	EEE	87 Bulk Fuel	91 Bulk Fuel	91 Bulk Fuel Repeat
Sample Date		**10/21/2010**	**10/8/2010**	**10/15/2010**	**10/15/2010**	**2/10/2011**
Fuel Analysis Performed at Outside Laboratory						
Research Octane (ASTM D2699)	RON	95.7	97.2	89.6		93.4
Motor Octane (ASTM D2700)	MON	86.3	88.5	84.6		87.5
(R+M)/2	AKI	91.0	92.9	87.1		90.45
Density @ 15.5C	kg/L	0.752	0.744			
API Gravity	°API	56.5	58.7			
Fuel Analysis Performed at NREL						
Ethanol Content (ASTM D5501)	%	18+/-1%				
Ethanol Content (IROX analyzer)	%	14%				
Fuel Analysis Performed at Mercury Marine						
Petrospec analyzer (E15 data ave. of 2 samples)						
Ethanol Content	%	14.1%	0	0	0	
RON	RON	95.7	95.8	89.4	92.9	
MON	MON	84.7	87.7	83.3	87.2	
(R+M)/2	AKI	90.2	91.7	86.4	90.1	
Reid Vapor Pressure (Mercury analysis)	PSI	8.5	9.0	10.8	10.7	

The distillation curves for the various test fuels were also measured. The results can be seen in Figure 3 below. The data shown in Figure 3 were from the actual test fuels used in this testing. The distillation curve from the E15 fuel showed a large step change in the region of the boiling point of ethanol, as was expected.

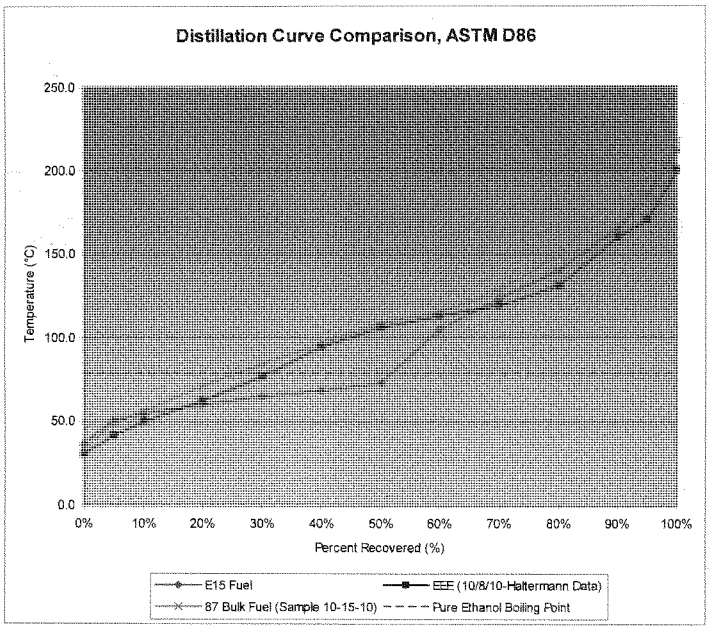


Figure 3: Distillation Curves of Test Fuels

Engine Testing Results

9.9HP Four-Stroke:

Endurance Test Results

The endurance testing on the 9.9HP engine family precipitated no significant failures. There were no incidents related to the test fuels reported on either engine. There were several parameters measured at the start, middle, and end of test to check the general health of the engine during the course of the endurance test. These included cranking compression, power cylinder leakdown, cam timing, and valve lash. All of these parameters remained relatively unchanged through the course of testing within the repeatability of the measurement techniques used. Several fuel-effect differences between the test engines, however, were discovered during the end of test teardown and inspection. These differences are summarized in the section below.

Emissions Testing Results

A summary of the emissions results are shown in Figure 4 below, with the 5 mode total weighted specific HC+NOx values plotted on the Y axis and the amount of endurance time on each engine plotted on the X axis. Each data point on the curve represents the average emissions value of the 3 emissions tests performed at each interval. The error bars represent the minimum and maximum values of the 3 emissions tests at each interval. The dashed yellow line shows

the data from the E0 engine (serial number 0R364814). The solid red and blue lines show the emissions data from the E15 engine (serial number 0R352904) using E15 and E0 (EEE) fuels, respectively. Figure 4 shows that the E0 engine had significantly lower emissions than the E15 engine when run on the same fuel. After reviewing the history of the emissions audits on this engine family dating back to its introduction in 2005, both of these engines were within normal production variability.

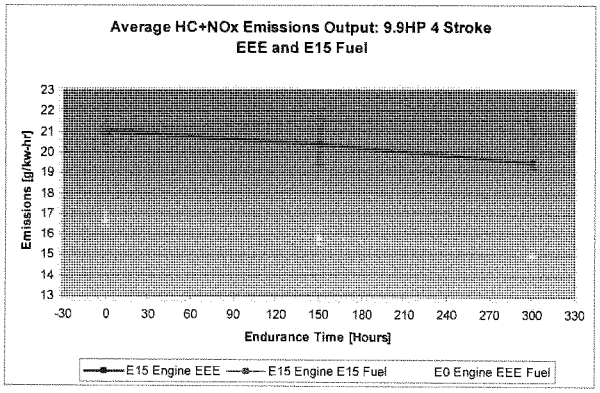


Figure 4: 9.9HP Four-Stroke HC+NOx Emissions Results Summary

In order to better understand the emissions output, the HC, NOx, and CO constituents were broken out and plotted separately in Figures 5, 6, and 7 respectively. The values for each constituent are the five mode totals of each.

Figures 5 and 6 show that the HC emissions predominantly defined the overall trends and variability in the total HC+NOx trends seen in Figure 4. The NOx data shown in Figure 6 had low test-to-test variability and the values were relatively flat (perhaps slightly declining for the E15 engine on E15 fuel) over the life of both engines.

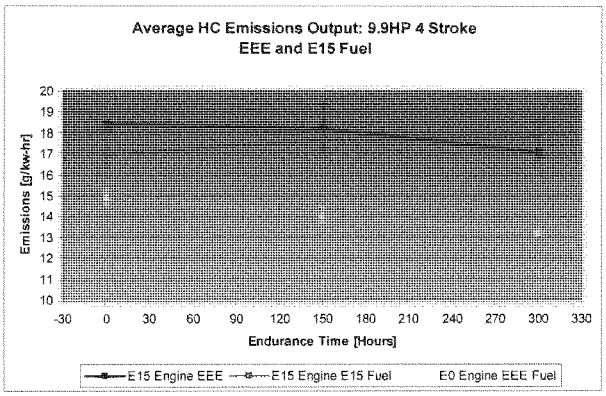


Figure 5: 9.9HP Four-Stroke HC Emissions Results Summary

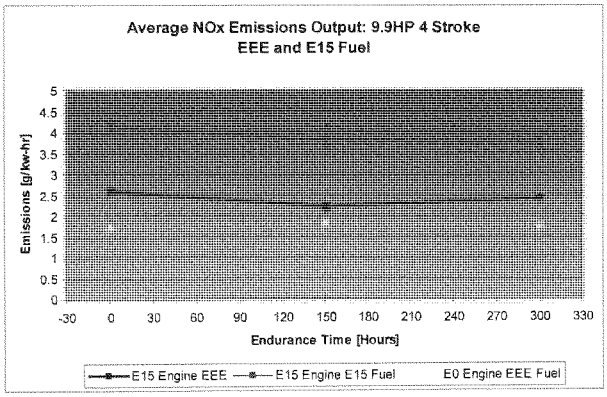


Figure 6: 9.9HP Four-Stroke NOx Emissions Results Summary

There was a general downward trend in CO over endurance time for the E15 engine on both fuels. The E0 showed some reduction in CO between 0 and 150 hours and remained relatively flat from 150 to 300 hours. The reduction in CO would suggest that the engines were running leaner since the primary driver for changing the CO emissions is typically the equivalence ratio.

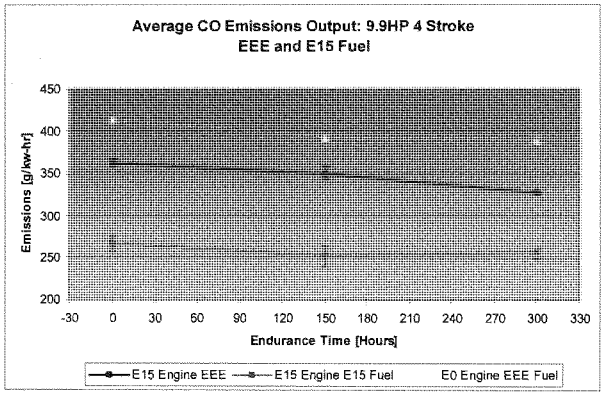
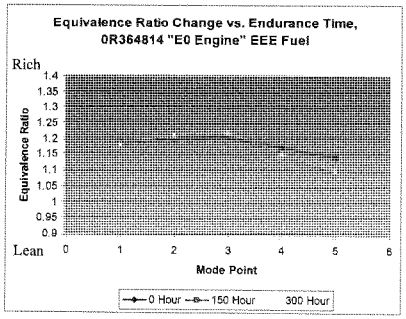
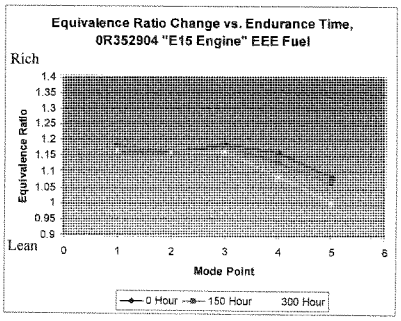


Figure 7: 9.9HP Four-Stroke CO Emissions Results Summary

The enleanment over time trend predicted from the CO data in Figure 7 was confirmed in Figures 8 and 9 for both the E0 and E15 engines operated on EEE-E0 fuel in both cases. The interesting thing to note was that the primary modes that became leaner were modes 4 and 5. During the end of test inspection on both engines, wear on the throttle plates was found on the sides where the throttle shafts went through the carburetor bodies. The wear caused gaps around the throttle plates which allowed excess air to enter the engines at low throttle opening positions (high manifold vacuum), which included Modes 4 and 5. The amount of wear found was considered normal for the amount of endurance time the engines experienced and was found on both engines.

It should be noted that the E15 engine ran leaner than the E0 engine when operated on EEE-E0 fuel, as can be seen in Figures 8 and 9 from a comparison of the "0 hour" equivalence ratios of both engines. This difference in equivalence ratio is considered to be in the normal production variability of this carbureted engine family.





Figures 8 & 9: Change in Equivalence Ratio vs. Endurance Time-EEE Fuel on E0 engine and E15 Engine

In addition, the equivalence ratio vs. endurance time data was plotted for the E15 engine when operated with E15 fuel in Figure 10. The graph shows the same trend of leaner operation vs. endurance time for Modes 4 and 5, as expected. However, when looking at the equivalence ratio values generated by the engine at Mode 5, it is clear that the engine ran very lean after 300 hours of endurance. This lean operation was the result of the inherent enleanment from the E15 fuel coupled with the trend of the engine to operate leaner with more endurance time due to the throttle plate wear.

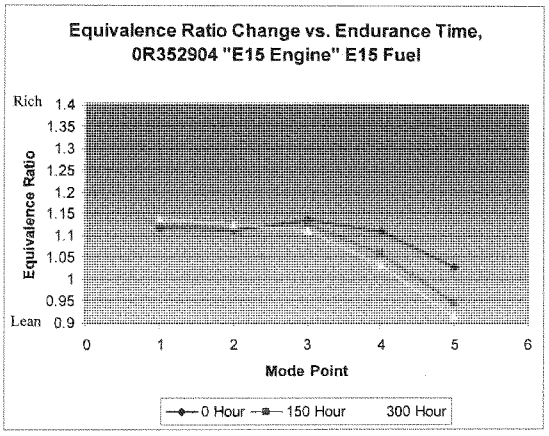
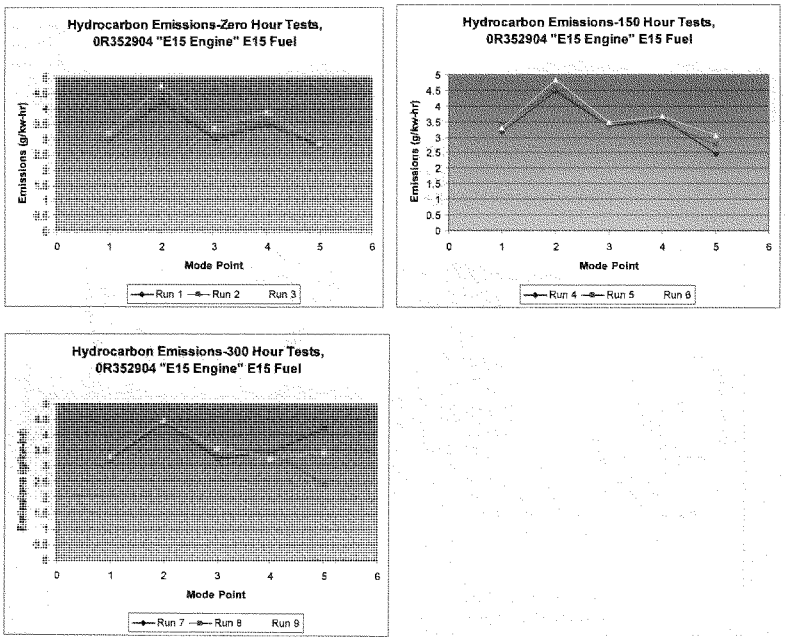


Figure 10: Change in Equivalence Ratio vs. Endurance Time-E15 Fuel on E15 Engine

It is clear that both engines ran leaner with more endurance time, yet the HC emissions increased (on average) for the E15 engine using E15 fuel (see Figure 5). To get more understanding, the hydrocarbon emissions results from each individual emissions test were plotted out in Figures 11-13 for the E15 tests at 0, 150, and 300 hours of endurance, respectively. The difference in HC at the 300 hour emissions check was caused by the Mode 5 (idle) point as Figure 13 shows. The high variability of HC emissions at Mode 5 may have been caused by poor run quality leading to intermittent misfire as the equivalence ratio trended further lean of stoichiometric (<0.925) with increasing run time.



Figures 11, 12, and 13: Hydrocarbon Emissions Outputs for Each Emissions Test, E15 Engine on E15 Fuel

Engine Performance Comparison

The power and torque data from the E0 9.9HP engine is shown in Figure 14 below. [Note: All power and torque curves were normalized to a set torque and power to make consistent comparisons possible across different engines, fuels, and amount of endurance time. The highest power and torque values generated on any of the tests were used as the reference power and torque setting and the runs were normalized back to these values.] There was a clear trend of increasing power and torque with more endurance time on the E0 engine. There was an increase of 3.2% in peak power and a 2.1% increase in peak torque when comparing the zero hour test with the 300 hour test. Similar graphs for the E15 engine are shown in Figure 15 on the E0-EEE fuel and in Figure 16 on the E15 fuel. Figures 15 and 16 show that there was generally a trend of decreasing power and/or torque with more endurance time on the E15 engine. On the E0-EEE fuel there was no change in peak power, but a loss of 1% peak torque when comparing the zero hour test with the 300 hour test on the E15 engine. Results on E15 fuel were similar, with a loss of peak power of 0.9% and a loss of peak torque of 2.1% when comparing the zero hour test with the 300 hour test. The mechanism that caused the E0 engine to have increasing power vs. endurance time and the E15 engine to have decreasing power vs. endurance time is unclear.

Figure 17 shows a comparison of the fuel's effect on the engine performance. The E15 fuel power run shows more torque generation throughout the speed range tested. There is approximately 1.75% more torque (and therefore, more power) on average throughout the speed range. Due to the enleanment from the fuel change, the engine may have been operating in a range closer to the Lean Best Torque on the E15 fuel and/or the volumetric efficiency may have been improved due to the additional charge cooling afforded by the heat of vaporization difference of the fuels. Figure 18 shows the difference in exhaust gas temperatures during the same power runs on the 2 different fuels. There was an approximately 17°C increase in EGT on both cylinders due to the enleanment from the E15 fuel.

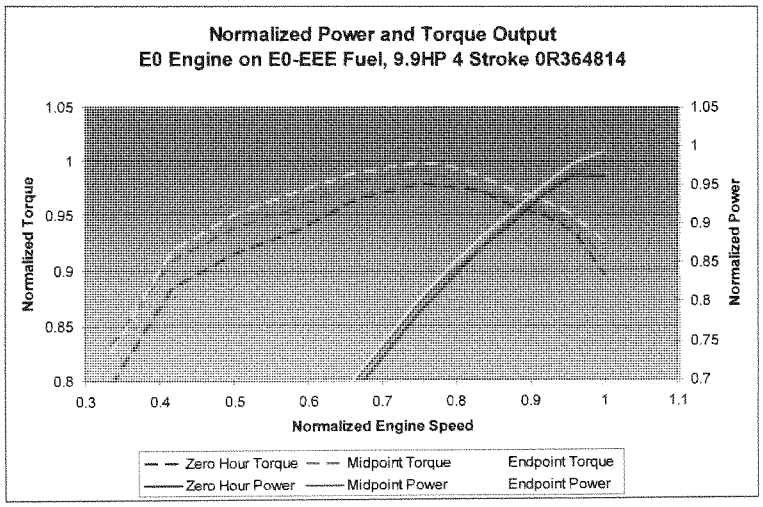


Figure 14: E0 Engine Power and Torque Output at Endurance Check Intervals

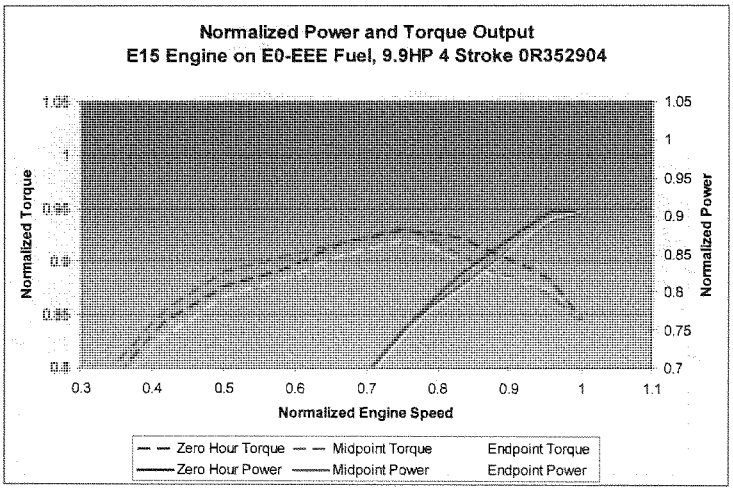


Figure 15: E15 Engine Power and Torque Output at Endurance Check Intervals-EEE-E0 Fuel

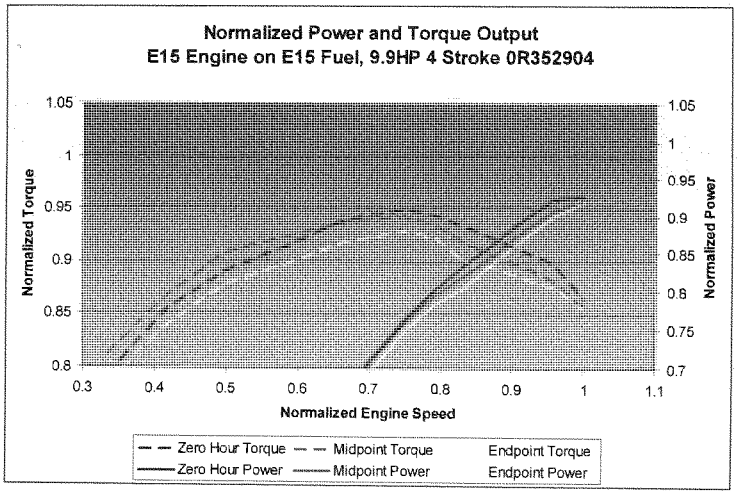


Figure 16: E15 Engine Power and Torque Output at Endurance Check Intervals-E15 Fuel

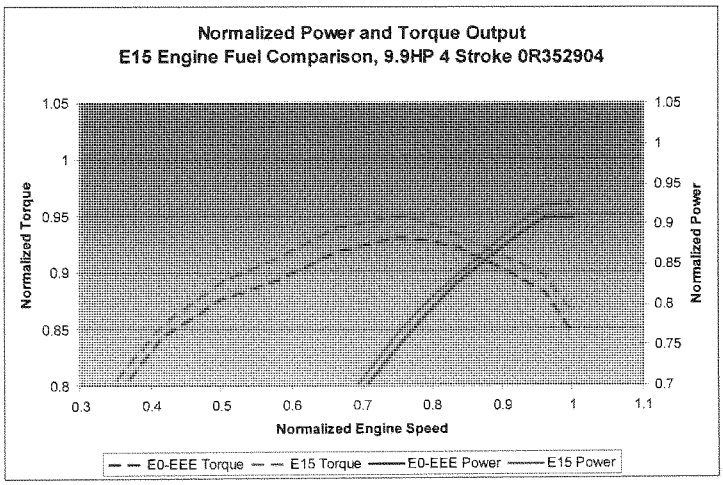


Figure 17: E15 Engine Power and Torque Output, Zero Hour Check-E0-EEE Fuel vs. E15 Fuel

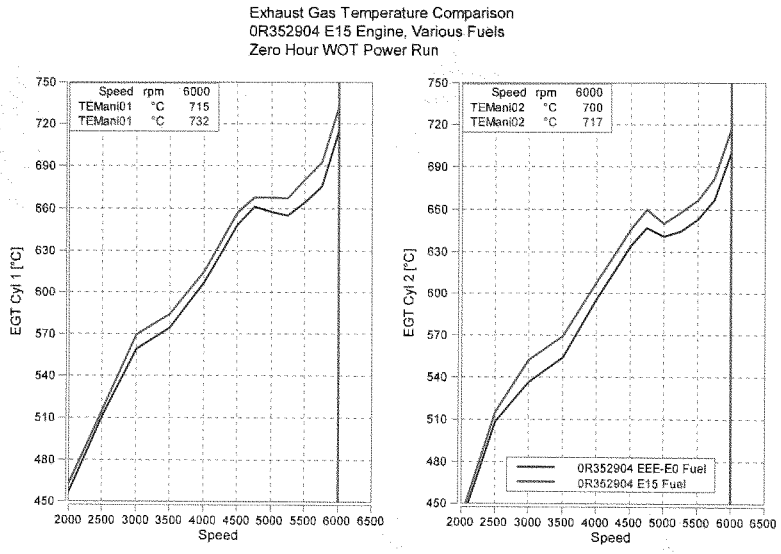


Figure 18: E15 Engine-Exhaust Gas Temperature Comparison, Zero Hour Check-E0-EEE Fuel vs. E15 Fuel

End of Test Teardown and Inspection

When the running engine testing was completed, the engines were disassembled and inspected. The main areas of focus were looking for signs of wear or deterioration and also material compatibility issues.

Upon initial inspection, there were indications that some of the main engine components on the E15 engine were subjected to higher operating temperatures. There were more carbon deposits observed on the undercrown area of the pistons and the small end of the connecting rod, suggesting that the pistons were operating at a higher temperature. Comparisons of the pistons and rods can be seen in Figures 19 and 20, respectively.

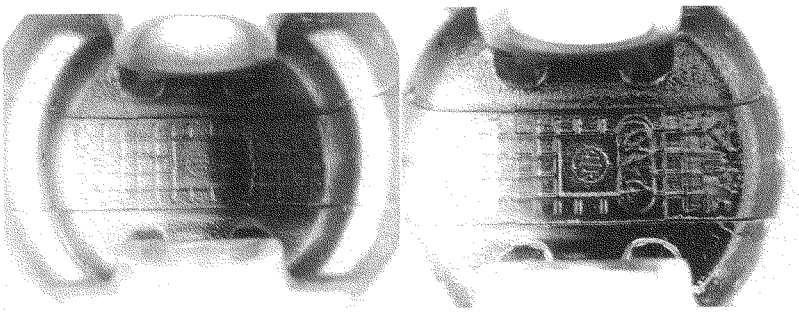


Figure 19: Piston Undercrown Carbon Deposit Comparison, Cylinder 1, E0 on Left, E15 on Right

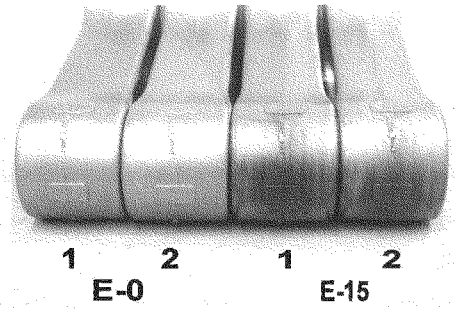


Figure 20: Small End of Connecting Rod Carbon Deposit Comparison, E0 on Left, E15 on Right

Although there were no indications of fuel pump failure during engine test, the mechanical fuel pumps were also disassembled and inspected following testing to look for abnormal signs of wear or degradation. The check valve gasket on the E15 engine showed signs of deterioration compared with that from the E0 engine. The gasket from the E15 pump had a pronounced ridge formed in the area that "hinged" when the check valve was in operation (see notes in Figure 21). The E15 gasket material in the area that sealed the check valve also had signs of wear that were more advanced than the E0 gasket. There was a significant amount material transfer from the gasket to the plastic check valve that it sealed as shown in Figure 22. Both fuel pumps were exposed to their respective test fuels for a period of approximately 2 months. More investigation is necessary to understand the effects of long term exposure of these components. It should be noted that the fuel pump flow performance was not tested. There were no indications that there was a problem with the fuel pump before disassembly. Once the deterioration was noted during teardown, it was determined that measuring the flow performance after disassembly and subsequent reassembly would have likely introduced error in the measurement.

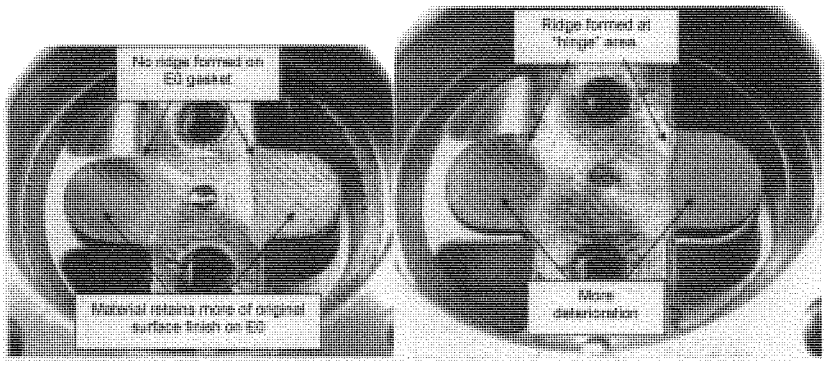


Figure 21: Fuel Pump Check Valve Gasket Comparison, E0 on Left, E15 on Right

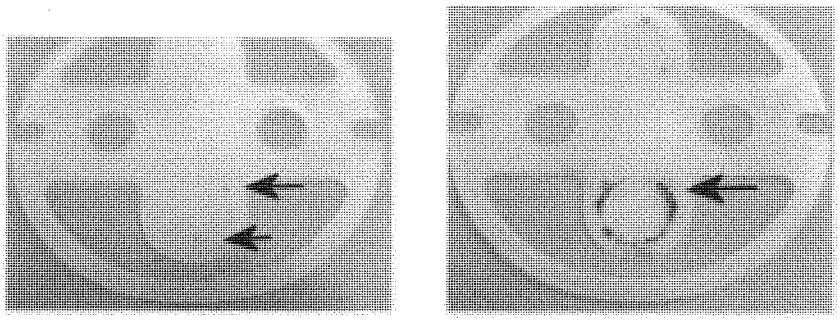


Figure 22: Fuel Pump Check Valve Comparison, E0 on Left, E15 on Right

Due to the visible differences in some of the engines' metal components, several components were sent to the in-house metallurgy lab for further analysis. Results of this analysis are included in Table 3. The Vickers hardness test was performed using a Clemet Microhamess Tester with a conversion to the Rockwell C scale where applicable (on steel parts). The Brinell scale was used for the aluminum parts, as they are much softer than the steel parts. The values shown were the average of 3 measurements for each component with the exception of the valve bridge in the cylinder head where only 2 measurements were taken. However, due to the fact that only 1 component from each engine on the 2 fuels was tested the results have no statistical significance and should be taken as an indicator only. Also, no hardness measurements were taken on the components prior to testing so there was likely some normal part-to-part variability in hardness as the components were originally manufactured.

Taking all of these issues into consideration there were indications that some of the components had different hardness values. These differences were most likely related to the continuous operating temperatures of the components. The most notable differences were the pistons, the valve bridge in the cylinder head and the intake valve stems. The piston measured from the E15 engine had a hardness value approximately 13.2% lower than the piston from the E0 engine. This would suggest that the E15 piston experienced a higher operating temperature, as expected due to the lean

operation. The carbon deposits on the underside of the piston due to oil coking also suggest the E15 pistons were running hotter as noted previously. The intake valve stem measurements showed an approximately 12% difference in hardness, with the E0 engine having the lower values. This difference would suggest that the E0 intake valve stems were running hotter during operation than the E15. This difference was likely due to the charge-air cooling effect of ethanol in the E15 fuel resulting in cooling of the intake port and leading to lower intake valve stem temperatures. The evaporative cooling in the intake port could also explain why the valve bridge hardness measurements indicated that the valve bridge on the E15 engine had lower operating temperatures evidenced by the roughly 11% higher hardness value. The other measurements showed differences that were likely within the repeatability of the measurements and the manufacturing variability so no conclusions could be drawn from them.

The piston is generally a higher-stressed component than the intake valve. The reduction in hardness of the intake valve for the E0 engine is not likely to increase failure rates since this engine family was qualified for E0 operation as a baseline. However, if the reduction in hardness of the piston with E15 fuel was found to be a statistically significant result, E15 fuel usage might increase the failure rate of this component.

Table 3: Hardness Measurements on Various 9.9HP Four-Stroke Engine Components

9.9HP Four Stroke	Hardness Scale	E0 0R364814	E15 0R352904	Percent Difference
Piston, Cyl 1	BHN	91.0	79.0	13.2%
Connecting Rod, Small End Cyl 1	BHN	112.0	112.0	0.0%
Exhaust Valve Stem, Cyl 1	Rc	21.7	22.1	-2.0%
Exhaust Valve Head, Cyl 1	Rc	30.1	30.7	-2.0%
Valve Bridge in Cyl. Head, Cyl 1	BHN	83.0	92.0	-10.8%
Intake Valve Stem, Cyl 1	Rc	33.0	36.9	-11.9%
Intake Valve Head, Cyl 1	Rc	39.6	39.1	1.3%

Verado 300HP Supercharged Four-Stroke:

Endurance Test Results

Several engine failures occurred during endurance testing on the Verado engines, two of which were not related to the fuel and one of which may have been associated with the use of E15 fuel. The two non-fuel-related engine failures included a casting defect and a test facility induced failure. A third engine failure, involving failed exhaust valves is believed to have been caused by the E15 fuel. Failure mechanisms are described in detail below.

E0 Engine #1-Casting Defect: The first engine to fail was the E0 Verado-serial number 1B812775. At 177 hours of WOT endurance (204.2 total engine hours) the engine was shut down for a routine oil check. An excessive amount of water was found in the oil. The engine was disassembled and the major components were pressure checked. A leak path was discovered from the water jacket to the intake port on one cylinder. The cylinder head was sectioned and an oxide fold line from the casting process was discovered. This defect was present from the time of the original casting process and took thermal cycling, load, and time to cause a leak. It was in no way associated with the fuel.

E0 Engine #2-Test Facility-Induced Failure: An additional engine was obtained to replace the original E0 engine and this engine was given the serial number 1B821775A. This engine did the initial dyno tests and was put on endurance. After 88.7 hours of WOT endurance (98 total engine hours), the engine was automatically shut down by the endurance facility control system for low exhaust gas temperature. Investigation showed water entering the exhaust stream. The engine was then disassembled and a significant amount of mineral deposits were found in the cooling passages, especially in the exhaust collector on the cylinder head. See Figure 23. [Note: For a coolant fluid, outboard engines draw in water from the body of water they are operating in, which in this case was the endurance test tank.] An interaction between

the pH and hardness of the water in the test tank created conditions that precipitated out minerals (primarily calcite) when exposed to the elevated temperatures in the cooling passage, especially near the exhaust collector. The blocked passages prevented adequate cooling in the exhaust collector, which eventually failed the head gasket and allowed water to enter into the exhaust stream. See Figure 24. It should be noted that these water chemistry conditions were specifically caused by the test facility water conditioning and would not be something that the engine would experience in real-world use.

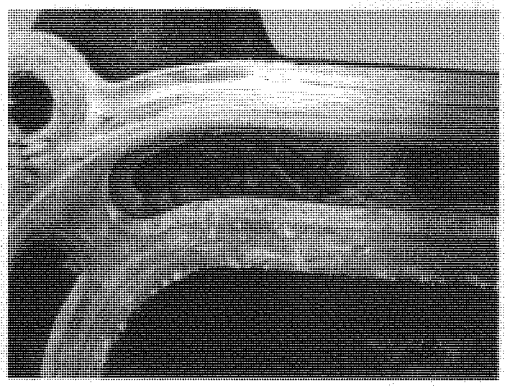


Figure 23: Mineral Deposits in Cooling Jacket, E0 Verado 1B812775A

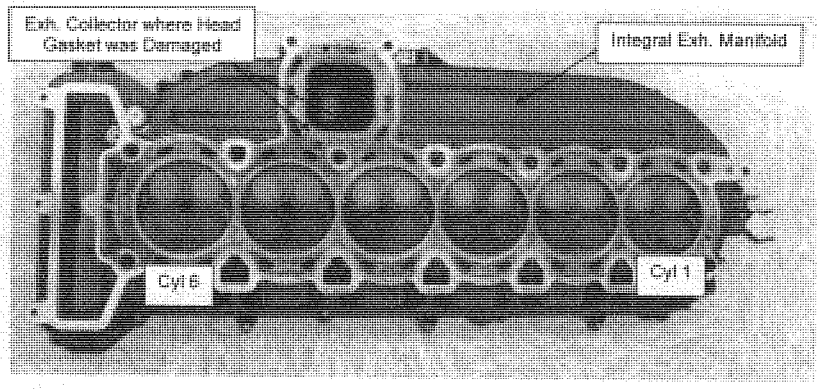


Figure 24: Verado Cylinder Head Indicating Where Head Gasket Failure Occurred, E0 Verado 1B812775A

E15 Engine: At 285 hours of endurance operation (323 total engine hours), the E15 Verado test engine (serial number 1B812776) was noted to have rough idle after restarting shortly after maintenance was performed. A compression check was performed showing no compression on cylinder 3. During disassembly a broken exhaust valve was found in cylinder #3. Further investigation found that the other exhaust valve on cylinder 3 had developed a crack, as well as one

of the exhaust valves in cylinder 6. See Figures 25 and 26. NOTE: The images shown in Figure 26 of the cracked exhaust valves had been cleaned of deposits prior to photography.

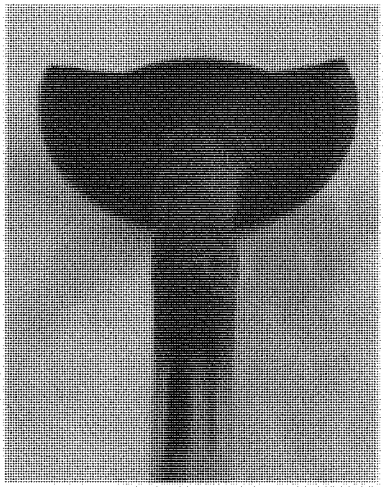


Figure 25: Broken Exhaust Valve from E15 Verado 1B812776, Top Valve in Cylinder 3

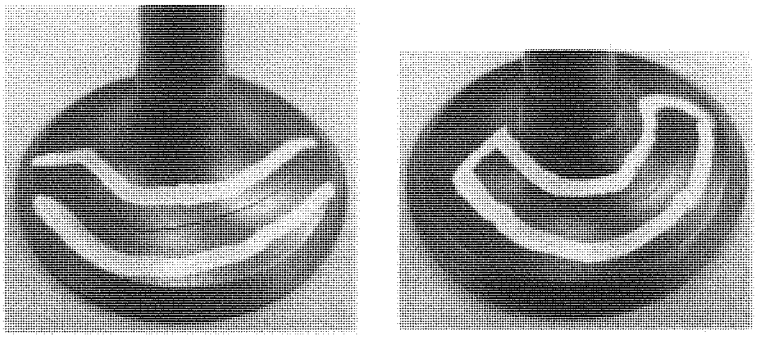


Figure 26: Cracked Valves from E15 Verado 1B812776, Bottom Valve in Cyl. 3 Left, and Top Valve in Cyl. 6 Right

The cracked valves and several valves without cracks from the E15 Verado were analyzed in Mercury's materials laboratory. The cracked valves were visually inspected with an optical stereoscope. The fatigue initiation sites were clearly identified. Figure 27 shows an example of the images of the initiation sites from the bottom exhaust valve from cylinder 3.

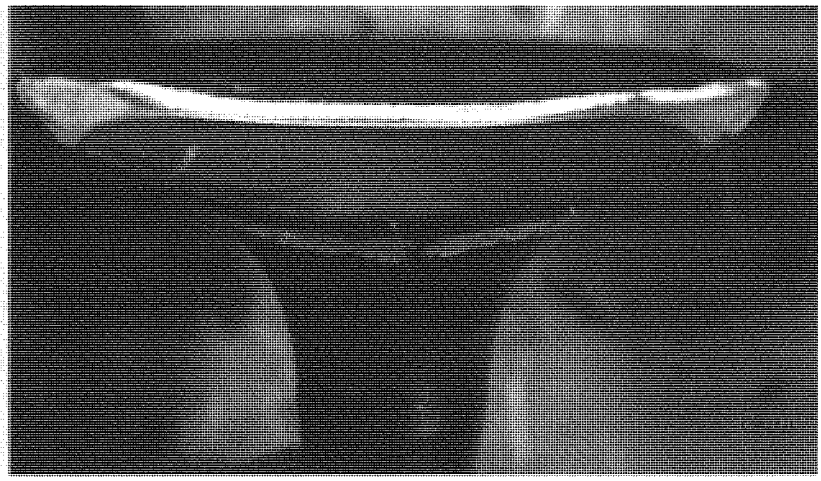


Figure 27: Fatigue Initiation Sites on Cylinder 3 Bottom Exhaust Valve, E15 Verado 1B812776

In addition to finding the fatigue initiation sites, the failed valves were checked for hardness. The cracked valves from the E15 engine were found to have hardness values much lower than new valves and below the minimum print specification of a new valve. Other sample valves were collected and analyzed from WOT endurance Verado engines that were run on E0 pump fuel during the same general timeframe as the E15 engine was run. In addition, samples of new valves were also acquired and analyzed. The hardness measurements showed that the valves from the engines operated on E0 fuel were actually harder than the new valves. The summary of hardness measurements are shown in Table 4. Note: All of the measurements were taken in the Rockwell A scale and converted to the Rockwell C scale due to the fact that the samples were mounted and polished to perform hardness measurements in the center of the cross section. This would negate any hardness effects from the mounting material.

Table 4: Verado Exhaust Valve Hardness Measurement Summary

Valve Description	Hardness (HRC)
E15: 1B812776 Cyl 3 Bottom	22
E15: 1B812776 Cyl 6 Top	22
E0: 1B812775 Cyl 3 Bottom	37.5
E0: 1B812775 Cyl 3 Top	36.5
E0: 1B812775A Cyl 3 Top	38
E0: 1B828629 Cyl 2 Top	37.5
New Valve #1	34.5
New Valve #2	34.5
New Valve #3	33
New Valve #4	33
New Valve #5	33.5

The Verado exhaust valves are made from Inconel 751, which is a heat-treatable alloy. This trait was used to estimate the metal temperatures experienced by the valves. The valve hardness data in Table 4 collected from the E0 engines

suggested that the metal temperatures experienced during operation were in a range that allowed age-hardening of the metal to make the valves increase in hardness. The hardness values of the E15 engine valves suggested that they were operating in a temperature regime that significantly reduced the hardness. In order to understand the hardness versus temperature, the new valves that were hardness checked were heated in an oven for 24 hours at various temperatures and then hardness was checked again. Figure 28 shows the results from the oven heating operation on the new valves. In Figure 28, the blue line shows the hardness data of the new valves before heat treatment and the red line shows the hardness data of the valves after heating. At metal temperatures above 870°C, the valves showed a dramatic decline in hardness according to this test data. The data suggest that the exhaust valves from the E15 engine may have experienced temperatures nearing 900°C.

One possible mechanism by which the E15 exhaust valves may have experienced such high temperatures would be a disruption of valve cooling during the portion of the cycle where the valve should be fully seated. During inspection, it was noted that several cam lobes showed wear and marking on the base circle portion of the lobe indicating that the exhaust valves had run out of lash. This suggested that excessive wear or valve head deformation may have occurred during operation, which caused the lash to diminish. This would have prevented the valve from seating properly resulting in a significant valve temperature increase due to lack of cooling on the seat. The valves or seats may have also had accelerated wear to diminish the lash due to lack of lubricity of the E15 fuel or because of the elevated temperatures caused by the lean operation on E15 fuel. In addition, if the exhaust valves were experiencing higher operating temperatures due to the higher exhaust gas temperatures from using E15 fuel, the overall length of the valve would be slightly longer. This longer length during operation would also reduce the amount of lash in the valvetrain and make the engine more prone to base circle contact on the cam. Plots comparing the measured cold valve lash over the course of endurance between the E0 and E15 engines are shown in Figures 32 and 33 below.

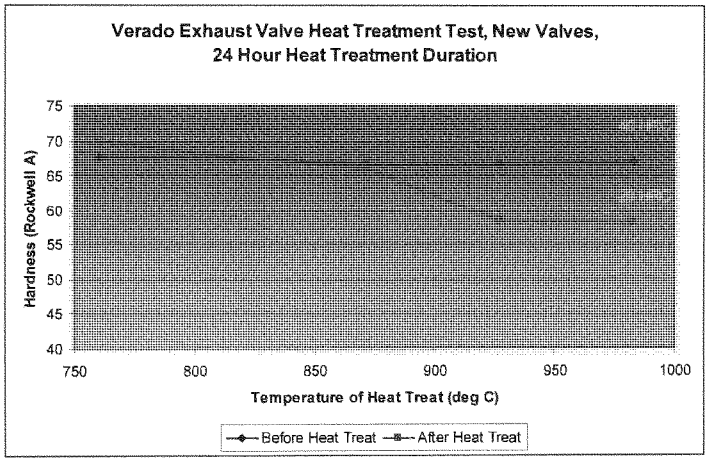


Figure 28: Heat Treatment Test of New Verado Valves

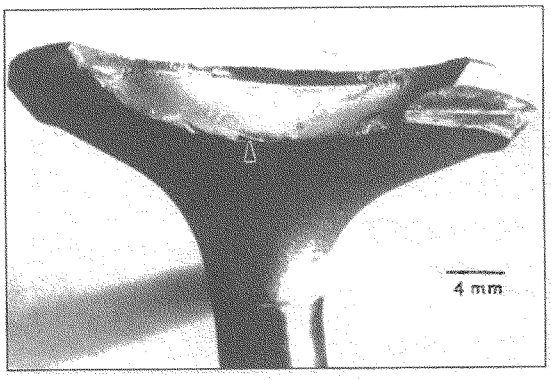


***Figure 6.8** Example of valve fillet fractures due to overstress, at elevated temperatures, and a corrosive environment; the arrow shows the crack initiation site at the fillet (Wang* et al.*).*

Figure 29: Exhaust Valve Failure from Literature Research Showed Similar Failure Mechanism [8]

Similar failure mechanisms were found in a literature search as shown in Figure 29. The failure is noted as a classic over-temperature failure. *"High temperatures and a corrosive environment at the exhaust fillet substantially weaken the valve strength."*[8] from: Introduction to Engine Valvetrains by Yushu Wang

Extensive development went into the valvetrain on this high-output engine. Upgrading the engine to account for higher exhaust gas temperatures due to a wider range of fuel properties would not be easily accomplished. The current production Verado exhaust valve is Inconel 751, which is categorized in the "superalloy" material classification.

It should be noted that the E15 engine (1B812776) was operating for a period of time when the mineral precipitation problem occurred on the second E0 engine (1B812775A). However, it is not believed that this contributed to the valve failure. The E15 engine (1B812776) did have some accumulation of precipitation flakes in the exhaust collector area, but not nearly to the extent that the E0 engine did. The E15 engine (1B812776) was not operating the entire time the E0 engine (1B812775A) ran when the mineral precipitation problem occurred. The head was sectioned and there were no mineral precipitation deposits on cooling jacket surfaces in cylinder 3 where the worst valve failure occurred. See Figure 30 for a picture of the sectioned head from the E15 engine (1B812776) showing no mineral deposits were present. Yellow spots in the cooling jacket were anti-corrosion coating from production where the paint did not fully coat interior surfaces of the cooling jacket. Figure 31 shows the same section of cylinder head from the E0 engine (1B812775A) that failed due to the mineral precipitation. This E0 engine (1B812775A) was also inspected for cracked exhaust valves and none were found. In addition, the hardness values of the exhaust valves were measured (see Table 4) indicating that the mineral precipitation issue did not affect the valve hardness on the E0 engine (1B812775A). There were several other Verado engines that were running endurance testing for a different project that failed due to the mineral precipitation issue. All other Verado engines that failed due to the mineral precipitation failed the head gasket in the exhaust collector area.

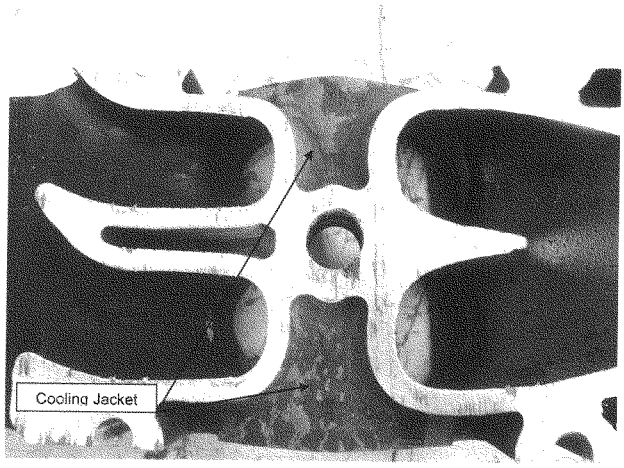


Figure 30: Photo of Section of Cylinder 3, E15 Verado 1B812776, Exhaust Ports on Left

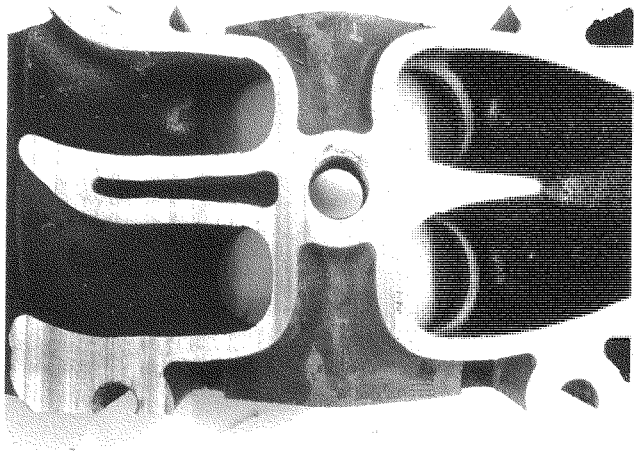


Figure 31: Photo of Section of Cylinder 3, E0 Verado 1B812775A, Exhaust Ports on Left

E0 Substitute Engine: In lieu of a completed test on E0 fuel, a substitute engine was chosen that had already been through endurance testing (serial number 1B828592). The engine that was used as a substitute had completed 372 hours of WOT endurance testing and was still intact. It ran in the same test facility running under the same test procedure as all other endurance testing as part of this project. The engine was used for a gearcase durability test for a different project so the rest of the engine was completely stock and built on the production line as were the other engines in this project. As such, it provided a suitable replacement for the incomplete E0 tests. For reference, the replacement engine (1B828592) was on test between the following dates: 11/15/2010 through 12/14/2010. The E15 engine 1B812776 was on test between 9/21/2010 through 11/12/2010.

As part of routine maintenance and checks during endurance, several valve lash measurements were taken at various intervals on the E0 substitute engine. Figures 32 and 33 below show the lash measurements during the course of endurance for both the E0 substitute engine (1B828592) and the E15 engine (1B812776), respectively. The solid red lines in the graph indicate the upper and lower lash specification on a new engine. It is clear from the lash measurements on the 2 engines that the E15 engine had a significantly faster decline in lash than the E0 substitute engine. The E0 substitute engine had 1 valve with higher lash value at the end of testing. There may have been some carbon or other deposits holding this valve off the seat during the measurement.

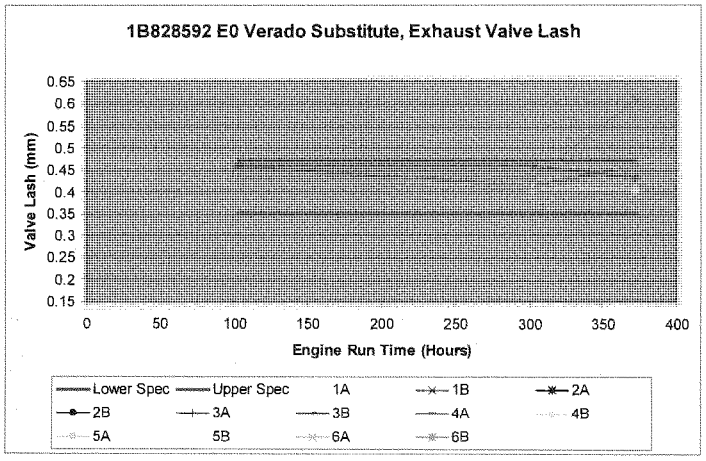


Figure 32: Exhaust Valve Lash (Measured Cold) vs. Endurance Time, E0 Substitute Engine

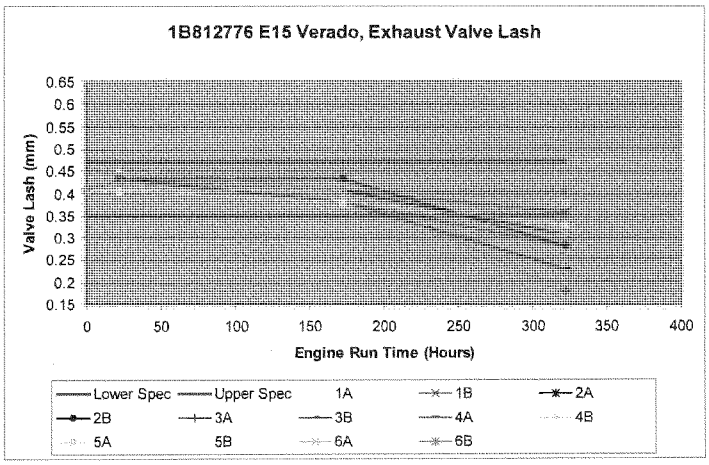


Figure 33: Exhaust Valve Lash (Measured Cold) vs. Endurance Time, E15 Engine

Emissions Testing Results

Due to failures of both the E0 and E15 engines, a complete analysis of the deteriorated emissions was not possible. However, with the data available several conclusions could be made. Figure 34 shows a graph of the Verado emissions that were collected. As was the case for the 9.9HP emissions data plots, each data point on the curve represents the average emissions value of the 3 emissions tests performed at each interval with error bars showing the range of the 3 emissions tests. The dashed yellow line shows the data from the original E0 engine (serial number 1B812775). The solid red and blue lines show the emissions data from the E15 engine (serial number 1B812776) using E15 and E0 (EEE) fuels, respectively. The single point in light blue at 372 hours shows the end of test emissions results for the substitute E0 engine (EEE fuel, serial number 1B828592). The graph shows a generally declining HC+NOx trend for the 2 original engines which is typical of Verado engines. The declining emissions trends on both engines would suggest that the ethanol fuel blend did not adversely affect the emissions deterioration on the Verado engine. The most notable aspect of the emissions output on the E15 engine was the fact that the total HC+NOx on E15 fuel was above 25 g/kw-hr, whereas the value on EEE-E0 was 21.5 g/kw-hr. The Family Emissions Limit (FEL) was set to 22 g/kw-hr for this engine family. A Verado engine generating 25 g/kw-hr would have failed an emissions audit. The increase in emissions can be primarily attributed to a significant increase in NOx due to the lean operation. Since the Verado is a highly boosted engine it is very sensitive to NOx generation due to changes in equivalence ratio. However, there was also an increase in HC emissions due to the E15 fuel, which would not be expected with a leaner equivalence ratio.

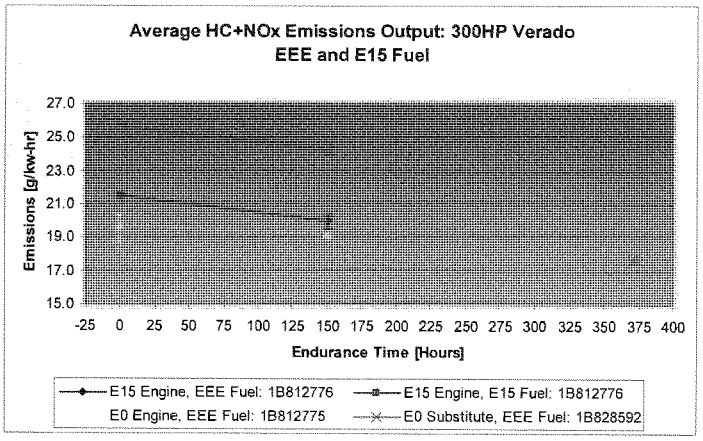


Figure 34: 300HP Verado HC+NOx Emissions Results Summary

In order to better understand the differences in the emissions outputs between the 2 fuels, graphs were made for each constituent of interest. Figures 35 through 37 show the NOx, HC, and CO emissions differences. The graphs were broken down by mode point for emissions tests performed prior to endurance on the E15 engine (1B812776). The values shown are the averages of the three repeated runs at "zero" hours.

Figure 35 shows the NOx emissions trends for the 2 fuels. The main differences were at Modes 1 and 2 which were both high load, boosted operating points. The fact that the NOx increased significantly with a lean shift due to the ethanol fuel blend was not surprising. Modes 3 and 4 did not show much difference because the engine was calibrated near an equivalence ratio of 1 on E0 fuel. The NOx trend with respect to equivalence ratio was near the peak at these points so a lean shift did not result in a significant change in NOx. Mode 5 was idle so the NOx generation at that point was essentially zero.

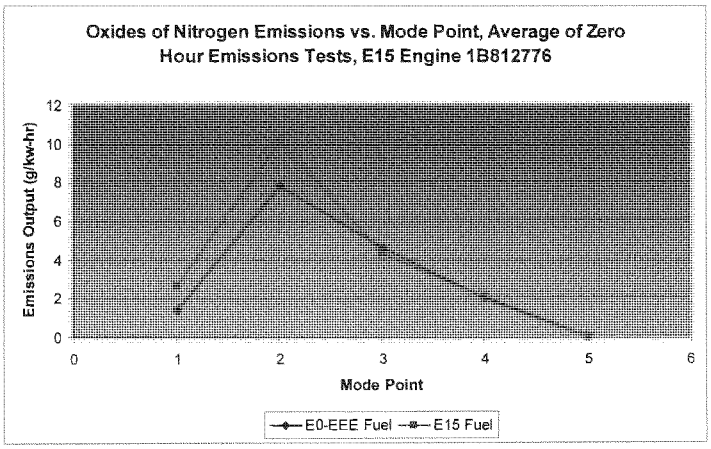


Figure 35: 300HP Verado NOx Emissions Results by Mode Point, Representative Zero Hour Test Data

The increase in HC output on E15 fuel was not an expected outcome of the test. Figure 36 highlights the difference in HC emissions between the 2 fuels. The main difference occurred at Mode 3, so further investigation was necessary into Mode 3 data specifically. However, it was also apparent that the HC output on E15 fuel was higher at Modes 1-4 despite the leaner operation from the fuel chemistry. This may suggest that the vaporization of the E15 fuel was inferior to that of the EEE fuel leading to poor fuel preparation. This is supported by data from Modes 1 and 2 where NOx and CO trends show that the engine did run leaner, yet had higher HC output when operated with E15.

The HC difference at Mode 3 was likely a result of the engine running substantially leaner than lean best torque (LBT). In this operating region, the Verado engine is calibrated slightly lean of the stoichiometric mixture on E0 fuel. With the use of E15 fuel, the engine operates significantly lean of LBT and, therefore, the torque production diminishes significantly. As a result, to achieve the specified torque set point for Mode 3 the throttle input had to be increased, yielding higher airflow and higher fuel flow. The fuel flow increased nearly 10% for essentially the same torque production with E15 fuel. In addition, it was noted that the intake air temperature was 12°C cooler at Mode 3 with E15 fuel. The cooler charge temperature was likely a result of the increased fuel vaporization cooling effect from the ethanol. The cooler temperatures in the intake may have impaired fuel preparation. The higher fuel flow combined with the inferior fuel preparation was likely the cause of the high HC output at Mode 3.

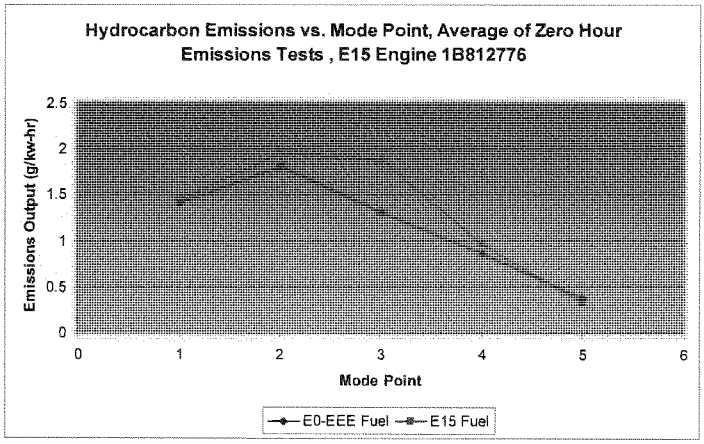


Figure 36: 300HP Verado HC Emissions Results by Mode Point, Representative Zero Hour Test Data

The CO emissions vs. emissions test mode point are shown in Figure 37. There was a significant reduction in CO emissions at Modes 1 and 2 when the engine was operated on E15 fuel, as expected. Modes 1 and 2 are calibrated rich of a stoichiometric mixture on E0, so the enleanment from E15 caused a reduction in CO. Modes 3-5 are generally insensitive in regard to CO because the operating points are calibrated near the stoichiometric mixture, so leaning the engine out due to the fuel had little effect at reducing CO relative to the changes seen at Modes 1 and 2.

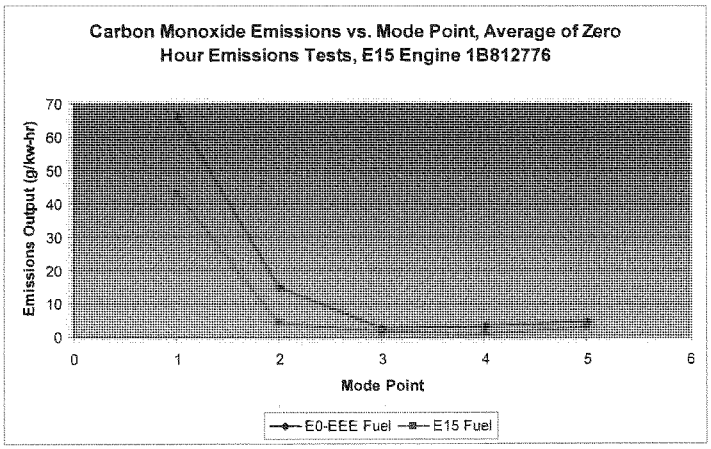


Figure 37: 300HP Verado CO Emissions Results by Mode Point, Representative Zero Hour Test Data

Engine Performance Comparison

Due to the engine failures, a complete comparison of engine performance vs. run time was not possible. The normalized power and torque data from the E0 Verado is shown in Figure 38. The changes from zero hours to 150 hours were less than 1% for peak torque (negligible) and a 2.3% reduction in peak power. The E0 engine produced less power output than the E15 engine when operated on the same E0 fuel. This difference of approximately 2% is considered normal production engine-to-engine variability.

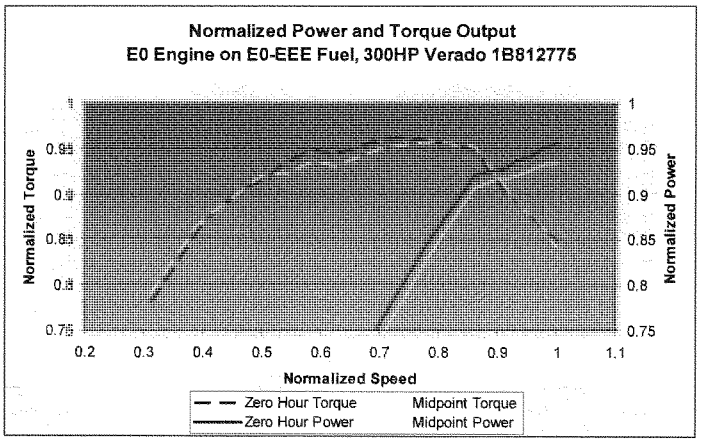


Figure 38: E0 Engine Power and Torque Output at Endurance Check Intervals-EEE-E0 Fuel

Power and torque data (normalized) for the E15 engine on both EEE-E0 fuel and E15 fuel is shown in Figure 39. There was an improvement in peak torque of 3.0% and in peak power of 1.5% when comparing the zero hour and midpoint runs on E0-EEE. The E15 engine showed negligible differences when comparing the midpoint power runs on E0-EEE and E15. It is unclear why this engine seemed unresponsive to the differences in charge cooling afforded by the ethanol blend fuel. Note: There was not a power run completed on E15 fuel at the initial zero hour measurement, which is why the midpoint data is compared in these figures.

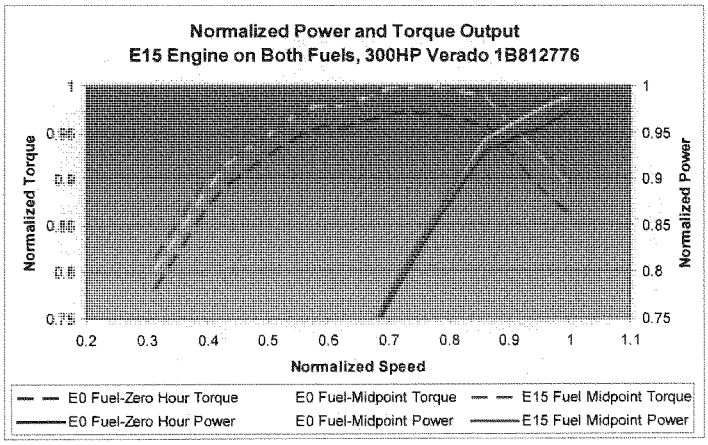


Figure 39: E15 Engine Power and Torque Output at Endurance Check Intervals-EEE-E0 and E15 Fuel

Figure 40 shows the difference in exhaust gas temperatures during power runs at the midpoint check on the 2 different fuels. There was up to a 30°C increase in EGT when operating on E15 fuel.

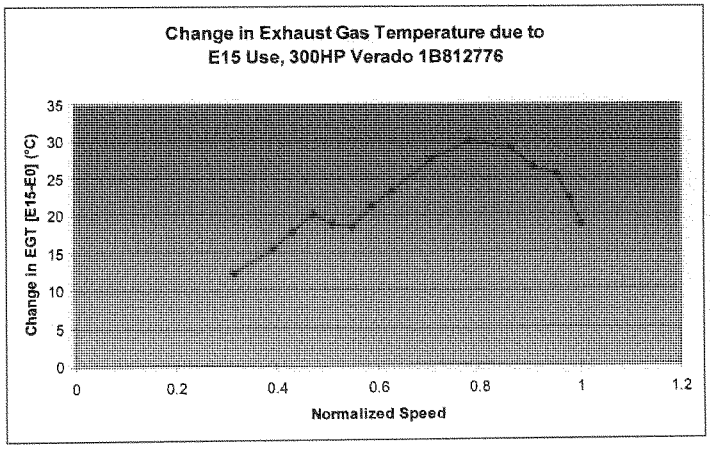


Figure 40: E15 Engine-Exhaust Gas Temperature Change at Wide Open Throttle, EEE-E0 to E15 Fuel

End of Test Teardown and Inspection

After all running engine tests were completed, the engines were disassembled and inspected. There was visual evidence that some of the internal components from the Verado E15 engine had experienced higher operating temperatures.

Upon disassembly, there were differences noted in the condition of the pistons from the 2 engines. Figure 41 shows pictures comparing the pistons from cylinder 2 from each engine. The piston from the E15 engine had a significantly higher amount of oil staining and carbon deposits than the piston from the E0 engine. The staining and deposits were noted on nearly every surface of the E15 piston compared with the E0 piston. Additionally, the pistons were sent to the metallurgy lab for hardness measurements. The hardness measurements were taken at several locations on the crown of the piston as well as a location on the internal portion of the piston just above the wrist pin bore after being sectioned. The average crown hardness of the E0 piston was 67.5 BHN (Brinell Hardness Number) while the E15 piston crown was 66.9 BHN. The internal piston hardness above the wrist pin bore was 74.1 BHN for the E0 piston and 71.5 BHN for the E15 engine's piston. Although the hardness measurements showed no effect of operating temperature on material properties, differences in visual appearance suggest that the E15 pistons operated at higher temperatures during running than the E0 pistons.

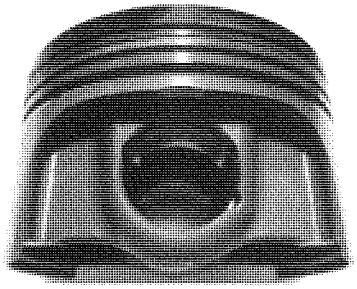


Figure 41: Piston Carbon Deposit Comparison, Cylinder 2, E0 on Left, E15 on Right

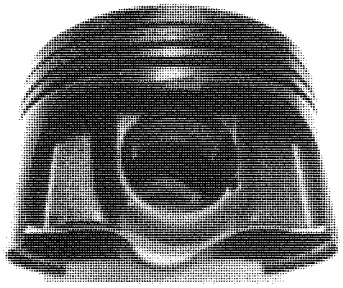


Figure 42 shows the small end of the connecting rods from each engine. The carbon deposits indicate that the E15 rods likely ran at higher operating temperatures. The carbon deposits on the rods are consistent with the carbon deposits observed on the pistons.

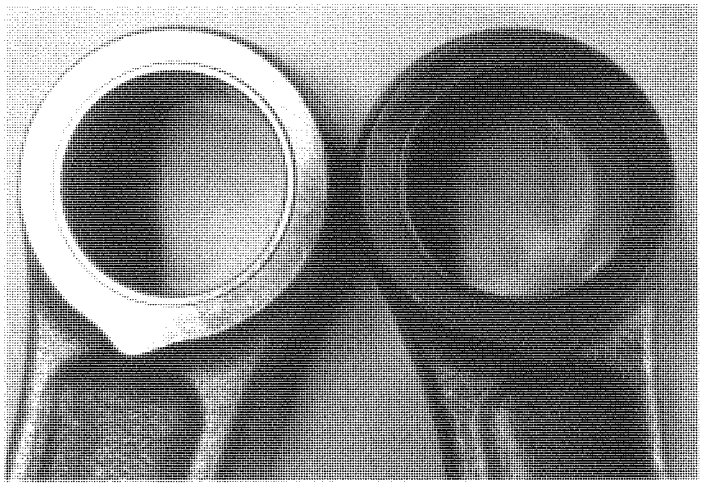


Figure 42: Connecting Rod Carbon Deposit Comparison, Cylinder 2, E0 on Left, E15 on Right

The exhaust valves were also closely inspected on the substitute E0 engine in order to compare with the valves that cracked on the E15 engine. With 372 hours of endurance aging time accumulated, no cracked valves were discovered during inspection under a microscope. The average hardness values of the exhaust valves from cylinder three of the E0 engine were 37.3 and 37.7 HRC. These values were consistent with other engines that were operated on E0 as indicated in Table 4.

During disassembly, the E15 engine was noted as having base circle contact on several of the exhaust cam lobes as noted above. The exhaust cam lobes from the substitute E0 engine did not show signs of base circle contact. The lash measurements shown in Figures 32 and 33 support these observations. A picture showing the difference in wear on the base circles of the exhaust cam lobes can be seen in Figure 43. The picture shows the E15 exhaust cam on the right and the E0 cam on the left. The wear pattern on the E15 exhaust cam lobe is apparent.

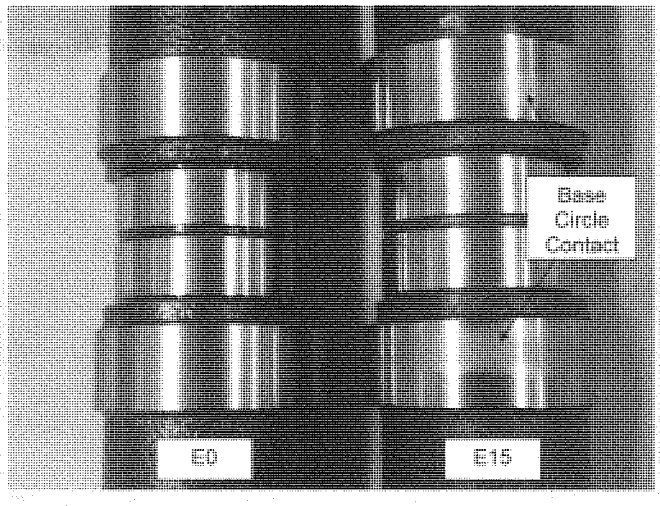


Figure 43: Exhaust Cam Lobe Base Circle Detail, Cylinder 3, E0 on Left, E15 on Right

200 EFI Two-Stroke:

Endurance Test Results

An engine failure prevented successful completion of the full endurance period for the 200 EFI E15 engine. The 200 EFI E15 engine failed a rod bearing before the completion of the endurance test. The 200 EFI E0 engine completed the 300 hour endurance test and all post-endurance dynamometer tests.

The E15 endurance engine failed at 283 total engine hours and had accumulated 256 hours of WOT endurance at the time of failure. Upon inspection it was found that the big end connecting rod bearing had failed on cylinder 3. The rod cap was still bolted to the rod after the failure. This engine family uses a fractured rod cap design with a roller bearing (typical for a two-stroke vs. a plain bearing in a four-stroke). Images of the remaining bearing cage and the damaged rod along with undamaged pieces for reference are shown in Figure 44. No rollers were found during teardown and were likely ejected from the bearing and made their way through the power cylinder and out the exhaust. There was extensive damage to the top of the piston on cylinder 3 indicating that the rollers went through the power cylinder. Due to the extensive damage to the bearing and connecting rod (since it failed at rated speed, full power) and the fact that not all of the pieces were recovered, root cause of the bearing failure was not conclusively determined. Little is known about the effects of ethanol blends on oil/fuel mixing and dispersion on total loss lubrication systems, such as the one on this engine family. More investigation is needed to understand if ethanol would negatively impact the lubrication systems on two-stroke engines.

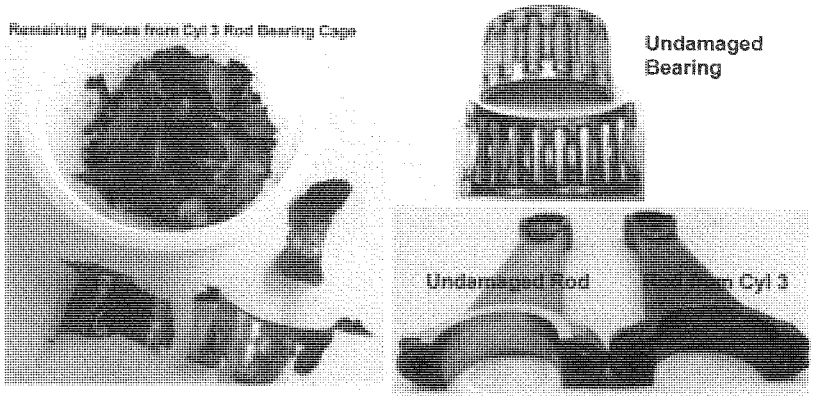


Figure 44: 200HP EFI Bearing Failure Pictures

Emissions Testing Results

As a result of the engine failure, a complete set of emissions data was not collected on the 200 EFI. However, conclusions can be drawn from the data that were collected. Figure 45 shows a summary of HC+NOx results from the emissions test on both engines. As Figure 45 shows, there was more variability in the E0 engine than on the E15 engine. E15 fuel did not have a detrimental effect on emissions degradation on this engine family. It is worth noting that of the roughly 120 g/kw-hr of HC+NOx, the NOx contribution is approximately 2 g/kw-hr. Since the HC is roughly 98% of the total HC+NOx, graphs depicting the changes in the individual constituents were left out of this report. The relative enleanment from the E15 fuel did slightly increase the NOx emissions, but that was not significant in comparison with the HC contribution.

The CO emission results from the 200 EFI engines are shown in Figure 46. The E15 fuel resulted in lower CO emissions, as expected due to the relative enleanment from the difference in fuel chemistry. Both engines and both fuels showed the same trend of increasing CO with more endurance time.

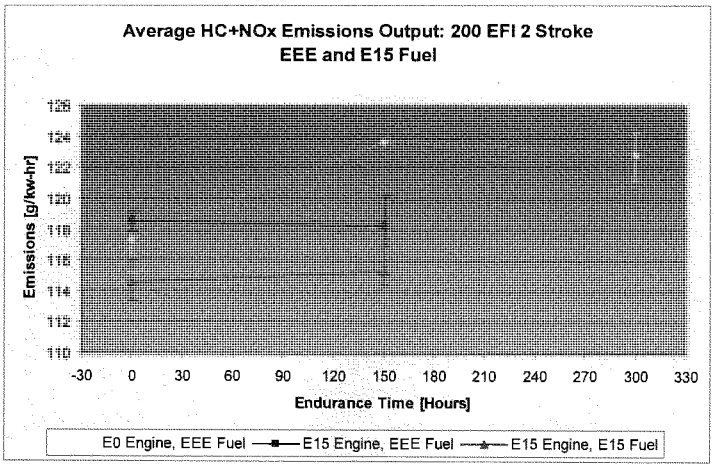


Figure 45: 200HP Two-Stroke HC+NOx Emission Results Summary

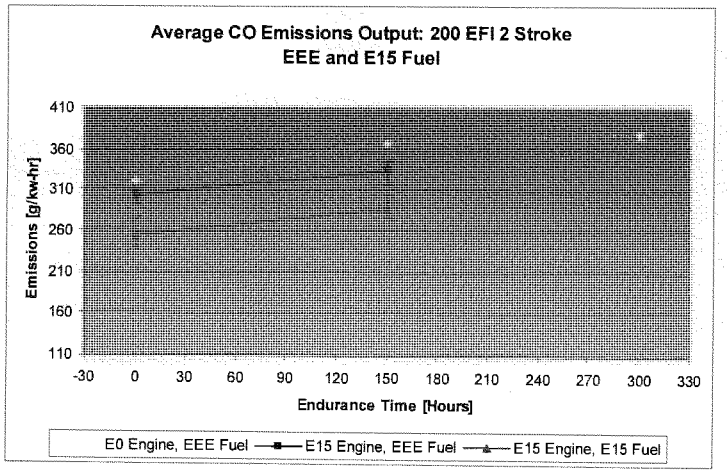


Figure 46: 200HP Two-Stroke CO Emission Results Summary

Engine Performance Comparison

The power and torque data (corrected per ISO 3046-1) from the E0 200HP EFI engine are shown in Figure 47. There were slight differences in the curves, but the changes from zero hours to 300 hours were less than 1% for both peak torque and peak power.

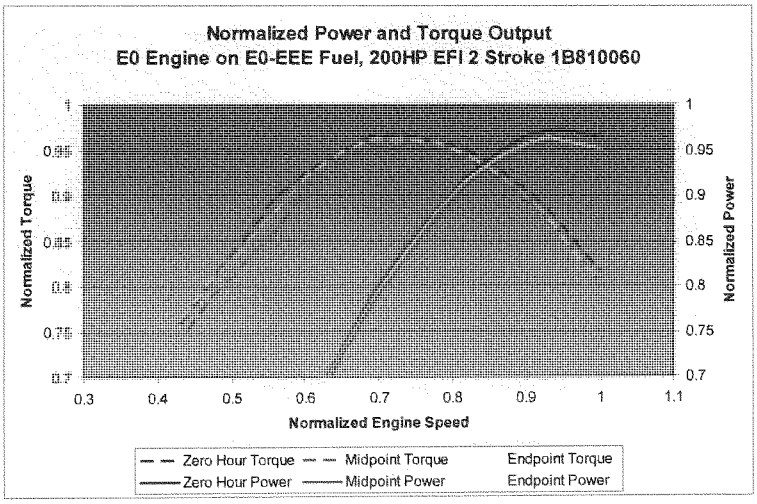


Figure 47: E0 Engine Power and Torque Output at Endurance Check Intervals-EEE-E0 Fuel

Data for the E15 engine on both EEE-E0 fuel and E15 fuel are shown in Figure 48. A comparison of the output at the zero hour and 150 hour checks are included. Similar to the E0 engine, there was less than a 1% change from the zero hour check to the 150 hour check for both the peak torque and peak horsepower for either fuel. There was an increase of approximately 2% in both peak torque and peak power when changing from E0 to E15 fuel. The engine may have been operating in a range closer to the Lean Best Torque on the E15 fuel due to the enleanment from the fuel change and/or the volumetric efficiency may have been better due to the additional charge cooling of the ethanol fraction. Figure 49 shows the difference in exhaust gas temperatures during the same power runs on the 2 different fuels. Since this was a 6 cylinder engine and individual cylinder measurements were possible, the average and maximum changes in EGT were plotted for clarity. On average use of the E15 fuel resulted in a 15-20°C increase in EGT in the range of frequent steady-state operation (>4500 RPM). The maximum increase in EGT for any individual cylinder when using E15 was 28°C.

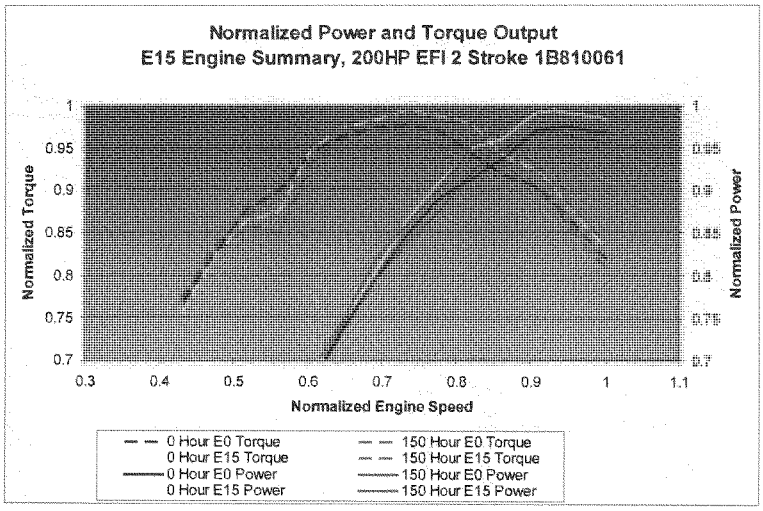


Figure 48: E15 Engine Power and Torque Output at Endurance Check Intervals-EEE-E0 and E15 Fuel

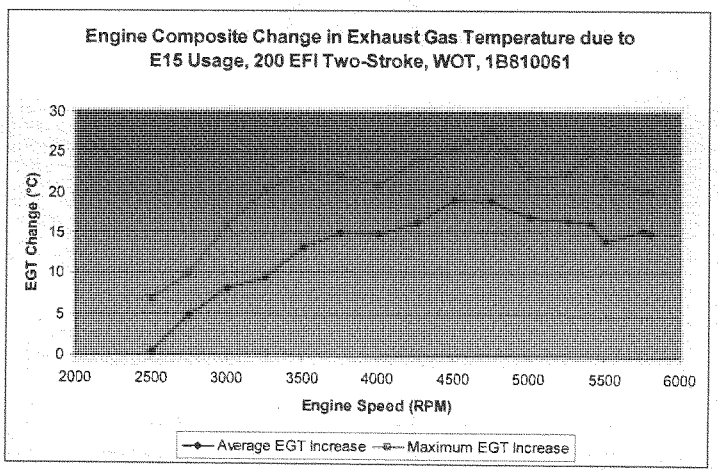


Figure 49: E15 Engine-Exhaust Gas Temperature Change at Wide Open Throttle, EEE-E0 to E15 Fuel

End of Test Teardown and Inspection

As was the case for the other engine families, the main areas of focus during teardown were looking for signs of wear and also material compatibility issues. Visual inspection of the components of the 2 engines did not suggest significant differences between them (aside from the rod bearing failure). In particular, the bore finish, carbon deposits, bearings from the small and big end of the rod, and main bearings were inspected for signs of mechanical or thermal distress and accelerated wear. No significant differences were noted aside from slight differences in the appearance of the wrist pins, as shown in Figure 50.

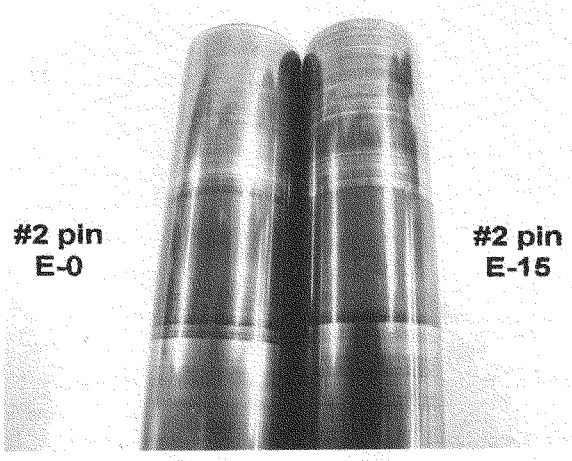


Figure 50: Cylinder 2 Wrist Pin Comparison, E0 on Left, E15 on Right

To provide a more in-depth analysis, selected components were further inspected. Using the same techniques as applied to the 9.9HP four-stroke components, the pistons and wrist pins from cylinder 2 on the 200HP EFI two-stroke engines were checked for material hardness. The results can be seen in Table 5. There were no significant differences in the hardness between the wrist pins, but there was a slight difference in hardness of the pistons (6.3%). The lower hardness of the piston on the E15 engine suggested it may have been running at higher temperatures. The nature of two-stroke engines causes them to be very sensitive to piston fit/piston temperature. An increase in piston temperature caused by fuel differences could cause increased propensity for power cylinder failures for customers. The slight difference in hardness was near the limit of repeatability for the test method so the results should be considered an indicator only. More testing would be necessary to gain confidence with a statistically significant sample size.

Table 5: Hardness Measurements on Various 200HP EFI Two-Stroke Engine Components

2.5L 200HP EFI	Hardness Scale	E0 1B860010	E15 1B810061	Percent Difference
Piston Wrist Pin, Cyl 2	Rc	54.7	54.1	1.1%
Piston Crown, Cyl 2	BHN	63.0	59.0	6.3%

In addition, the high pressure fuel pumps from both engines were sent to the pump manufacturer for flow testing. There were no significant differences in pump output between the 2 pumps, and they were within expected flow ranges for end of life components.

Additional Testing

4.3L V6 Catalyzed Sterndrive Emissions Comparison

Since the E15 fuel and a catalyzed engine were both readily available in the test lab, additional testing was performed beyond the test program requirements. Emissions tests were performed on E0-EEE fuel and E15 test fuel to determine any immediate impacts of increased ethanol for this engine family. No durability testing was performed. The 4.3L V6 sterndrive engine (General Motors V6 that was adapted and modified for marine use) was equipped with closed-loop electronic fuel injection and exhaust catalysts. The standard calibration for this engine in Mode 1 operation (rated speed and power) was such that the engine ran rich of stoichiometric to control exhaust gas temperatures. This is a common engine control approach to protect components during high power operation. For the type of exhaust gas oxygen sensor used on this engine, rich operation allows for no feedback control of the fuel air mixture. As such, the engine ran open-loop at Mode 1. All other modes ran closed-loop. The 5 mode HC+NOx and CO emissions totals were lower on E15 fuel due to the fact that the engine ran approximately 4.5% leaner on the E15 fuel at Mode 1. The HC+NOx at Mode 1 changed from 1.18 g/kw-hr on EEE to 1.10 g/kw-hr on E15. This small reduction was driven by the reduction of HC emissions. The NOx emissions increased on E15, but not as much as the HC decreased, yielding an overall lower total. The CO at Mode 1 was reduced from 45.6 g/kw-hr on EEE to 29.8 g/kw-hr on E15. The reduction of CO was attributed to the leaner operation at Mode 1. The HC+NOx and CO values for the remainder of the mode points were essentially the same since the closed loop fuel control allowed the engine to run at the same equivalence ratio. See Figure 51 for details of the emissions outputs.

The leaner operation at wide open throttle (Mode 1) caused an increase in exhaust gas temperatures when operating on E15 fuel. The exhaust gas temperature increase across all 6 cylinders was approximately 20°C. The elevated EGT during WOT operation could cause valvetrain durability issues. The catalyst temperatures were approximately 32°C higher at Mode 1 with E15 fuel. This increase in catalyst temperature at WOT would likely cause more rapid deterioration of the catalyst system leading to higher exhaust emissions over the lifetime of the engine. The full impact of E15 on catalyst life would depend on the duty cycle of this engine in actual application. Typical duty cycles of marine engines include considerable amounts of time at WOT operation (open loop) so the catalyst temperature increase is of concern.

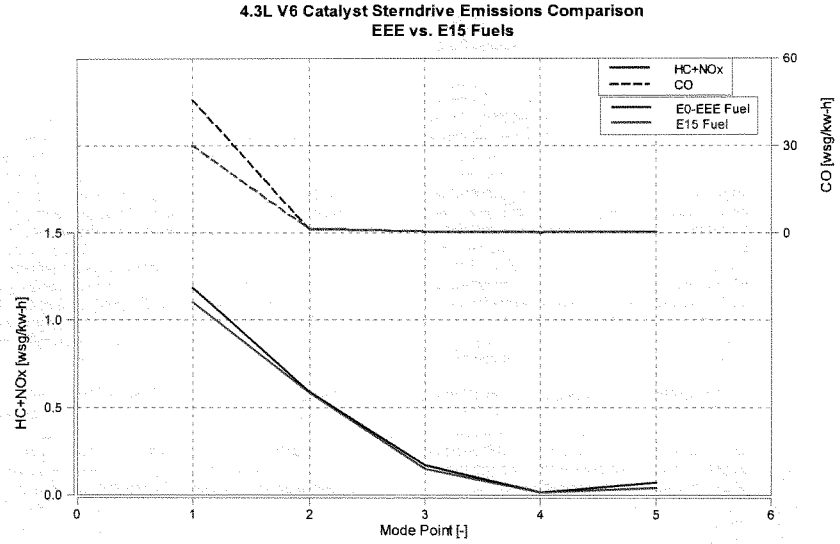


Figure 51: Emissions Comparison 4.3L V6 Catalyst Sterndrive, EEE vs. E15

The other aspect that was affected by running E15 on the closed-loop controlled engine was the fuel consumption. Since the closed-loop control system drove to an equivalence ratio, the fuel flow rate increased to account for the differences in fuel chemistry. Table 6 shows the fuel flow measurements by mode point along with the percent difference in fuel flow between the 2 fuels (positive values mean E15 fuel flow is higher). In closed-loop operation, the fuel flow increased 5.3% on average on E15 fuel. This increase in fuel flow causes concerns not just in fuel mileage, but also in useful range of the craft.

Table 6: Fuel Flow Comparison on 4.3L V6 Catalyst Sterndrive, EEE vs. E15

	EEE	E15	
Mode	Fuel Flow	Fuel Flow	Difference
	kg/hr	kg/hr	%
1	46.8	47.0	0.4%
2	24.2	25.5	5.3%
3	13.1	13.7	4.7%
4	7.1	7.5	5.2%
5	2.0	2.1	5.9%

Mode 2-4 Average 5.3%

Summary of Results:

EPA's recent announcement of a partial waiver approving E15 fuel for use in 2001 and newer cars and light trucks[9] will create an opportunity for consumers to misfuel their marine engines. This program indicates that misfueling currently available marine outboard engines may cause a variety of issues for outboard engine owners. These issues included driveability, materials compatibility, increased emissions, and long-term durability. There were also 2 examples of how the ethanol fuel caused an increase in fuel consumption.

9.9HP Carbureted Four-Stroke:

The E15 engine showed high variability in HC emissions at idle during the emissions tests at the end of the 300 hour endurance period. Both the E0 control engine and E15 test engine ran leaner at idle and low speed at the end of the endurance test. When operated on E15 fuel after 300 hours of endurance, the lean operation at idle coupled with the additional enleanment from the E15 fuel caused the engine to exhibit misfire and poor run quality (intermittent misfire or partial combustion events). A misfiring engine would cause customer dissatisfaction due to the inability to idle the engine properly, excessive shaking, and hesitation or possibly stalling upon acceleration. As it relates to this study, the misfire caused an increase in HC emissions at idle. This increase in HC variability at idle caused the average total HC+NOx to increase from the start to end of endurance, whereas the HC+NOx on E0 fuel on both engines showed a decreasing trend. As expected, the CO emissions were reduced when using E15 fuel due to the leaner operation.

The power and torque output of the E15 engine was higher with E15 fuel than with E0 fuel. The power and torque output of the E0 control engine increased slightly with more endurance time. The power and torque output of the E15 test engine showed a flat or declining trend with more endurance time.

The end of test inspection showed evidence of elevated temperatures on base engine components due to the lean running on E15 fuel. There were significantly more carbon deposits on several components of the E15 engine, indicating that these parts likely had higher metal temperatures during operation. Hardness measurements indicated that the pistons had higher operating temperatures on the E15 engine. The exhaust gas temperature increased 17°C at wide open throttle as a result of the leaner operation on E15 fuel.

The fuel pump gasket on the E15 engine also showed signs of deterioration compared with the E0 engine after approximately 2 months of exposure to E15 fuel.

300HP Four-Stroke Supercharged Verado:

The E15 Verado failed 3 exhaust valves prior to completion of the endurance test. One valve completely failed and 2 others had developed significant cracks. Metallurgical analysis showed that the valves developed high cycle fatigue cracks due to excessive metal temperatures. The majority of exhaust valves on the E15 engine lost a significant amount of lash which may have contributed to the observed valve failures. The exhaust gas temperature increased 25-30°C at wide open throttle due to the lean operation with E15 fuel.

In addition to the elevated temperatures on the exhaust valves, the pistons showed evidence of higher operating temperatures. The carbon deposit differences indicated that the E15 engine's pistons were hotter during operation.

The E15 Verado generated HC+NOx values in excess of the Family Emissions Limit when operated on E15 fuel, but did not exceed the limit when operated on EEE-E0. The primary contributor to the increase in exhaust emissions was the NOx due to enleanment caused by the oxygenated fuel. The CO emissions were reduced when using E15 fuel due to the leaner operation, as expected.

At emissions mode point 3, the lean combustion due to the E15 fuel caused the engine to lose torque output due to operation significantly leaner than LBT. As a result of the torque loss, the throttle input had to be increased 10% to maintain the same torque output as on E0-EEE fuel. The change in throttle input caused an increase in fuel flow of 10%. Mode 3 is representative of a typical cruising speed and load. The E15 fuel would cause the fuel consumption to be 10% higher at that operating point for a customer.

200HP EFI 2.5L Two-Stroke:

The 200HP EFI two-stroke engine showed no signs of exhaust emissions deterioration, though the emissions output after the full endurance testing was not measured due to a failure of the E15 engine. The primary driver of the HC+NOx emissions on this engine family was HC (approximately 98% of the HC+NOx total). As expected, since the E15 fuel caused the engine to run lean, the HC emissions were lower, as were the CO emissions. There was more variability of HC+NOx observed on the E0 engine than the change in emissions on the E15 engine. The deterioration of the CO emissions had similar trends between the 2 engines.

The endurance test of the E15 engine was stopped short of the 300 hour target due to a connecting rod bearing failure on cylinder 3. The root cause of the bearing failure could not be identified. More testing is necessary to understand the effects of ethanol on two-stroke engine lubrication mechanisms where the oil and fuel move together through the crankcase. The E0 engine completed the entire 300 hours of durability testing.

Other than the bearing failure, the end of test teardown and inspection did not show any visible significant difference between the 2 engines. Hardness checks performed on the pistons of both engines indicate that the E15 engine may have had higher piston temperatures, a concern on two-stroke engines where higher temperatures could lead to more power cylinder failures. The exhaust gas temperature increased 15-20°C on average due to the lean operation with E15 fuel.

4.3L V6 EFI Four-Stroke Catalyzed Sterndrive

Since E15 fuel was readily available in the test facility and an engine equipped with exhaust catalysts was on the dynamometer, emissions tests were conducted on a 4.3L V6 sterndrive engine. No durability testing was performed. At rated speed and wide open throttle the exhaust gas temperatures increased by 20°C on average and the catalyst temperatures increased by 30°C. This increase in catalyst temperature would likely cause more rapid aging and deterioration of the catalyst system at WOT. The overall effect of the increase in deterioration rate would be duty cycle dependent. The HC and CO values decreased at the Mode 1 (rated speed, rated power) emissions test point, which is an open loop operating point, due to leaner operation with E15 fuel, as expected. The fuel consumption increased by 4.5% at the operating points that were running in closed-loop fuel control.

Recommendations:

This test program was limited in scope in terms of operating conditions. More investigation is necessary to understand the effects over a broader range of conditions. Ethanol's effects on part load operation, cold start, hot restart/vapor lock, and overall driveability need to be evaluated. The wide range of technology available for marine engines due to the wide range of engine size will complicate this issue significantly. Mercury Marine produces engines from 2.5HP-1350HP with a wide array of technologies ranging from two-stroke or four-stroke; carbureted, EFI, or direct fuel injected; naturally aspirated, supercharged, or turbocharged; and more.

Ethanol's ability to absorb water into the fuel is of paramount concern for the marine market and this issue has not been addressed in this test program. The contaminants that water can bring with it, potentially saltwater, can cause severe corrosion in fuel systems. A leak or fuel system failure could cause the engine to be inoperable and leave the vessel stranded, which would obviously be a major dissatisfaction to the customer. In addition, a better understanding of the effects higher ethanol blends have on marine fuel systems in terms of materials compatibility and corrosion is needed. Marine vessels tend to have very long storage durations, can be stored in very humid environments, and will have more opportunities to have fuel system exposure to water, including saltwater.

More testing is needed to understand how ethanol blends affect oil dispersion in two-stroke engines that have fuel and oil moving through the crankcase together. Ethanol tends to be a good solvent and may break down lubrication at critical interfaces by cleansing these surfaces of the residual oil film.

References:

1. B. Beilfuss et al, "Mercury Marine's New High Performance 6-Cylinder Engine Family: Next Generation of Marine Technology", Presented at *25.Internationales Wiener Motorensymposium (25th International Vienna Engine Symposium)*, April 29-30, 2004
2. M. Ross, "Fuel Efficiency and the Physics of Automobiles", *Contemporary Physics* 38, no. 6 P 381-394, 1997.
3. ASTM Standard D86, 2010a, "Standard Test Method for Distillation of Petroleum Products at Atmospheric Pressure," ASTM International, West Conshohocken, PA, 2010, DOI: 10.1520/D0086-10A, www.astm.org.
4. ASTM Standard D2699, 2010, "Standard Test Method for Research Octane Number of Spark Ignition Engine Fuel," ASTM International, West Conshohocken, PA, 2010, DOI: 10.1520/D2699-10, www.astm.org.
5. ASTM Standard D2700, 2010, "Standard Test Method for Motor Octane Number of Spark Ignition Engine Fuel," ASTM International, West Conshohocken, PA, 2010, DOI: 10.1520/D2700-10, www.astm.org.
6. ASTM Standard D5501, 2009, "Standard Test Method for Determination of Ethanol Content of Denatured Fuel Ethanol by Gas Chromatography," ASTM International, West Conshohocken, PA, 2009, DOI: 10.1520/D5501-09, www.astm.org.
7. ASTM Standard D5845, 2001(2006), "Standard Test Method for Determination of MTBE, ETBE, TAME, DIPE, Methanol, Ethanol and tert Butanol in Gasoline by Infrared Spectroscopy," ASTM International, West Conshohocken, PA, 2006, DOI: 10.1520/D5845-01R06, www.astm.org.
8. Y. Wang, *Introduction to Engine Valvetrains*, Copyright 2007: SAE International, Warrendale, PA. P. 553
9. "EPA Announces E15 Partial Waiver Decision." United States Environmental Protection Agency, Office of Transportation and Air Quality, EPA-420-F-11-003, January 2011.

Approximate schedule for December 5 RFS hearing

Exact timing for each panel will depend on dropouts and additions to the schedule, time required for questions from the EPA panel, and breaks

Panels 1 through 5	9:15am - 11:30am
Panels 6 through 10	11:30am - 2:00pm
Panels 11 through 15	2:00pm - 4:30pm
Panels 16 through 20	4:30pm - 7:00pm
Panels 21 through 25	7:00pm - 9:00pm

Panel 1	
Charles T. Drevna	American Fuel & Petrochemical Manufacturers
John Bullock	Darling International, Inc.
Jeremy I. Martin	Union Of Concerned Scientists
Bob Dinneen	Renewable Fuels Association
Mike Brown	National Chicken Council
Judd Hulting	Patriot Renewable Fuels, LLC

Panel 2	
Bruce Braley	U.S. Representative
Jan Koninckx	Dupont
Bob Greco	American Petroleum Institute
John Urbanchuk	ABF Economics
Anne Steckel	National Biodiesel Board
R. Timothy Columbus	SIGMA

Panel 3	
Peter Welch	U.S. Representative
Jeff Johannesmeyer	Western Iowa Energy
Paul Beckwith	Butamax
Robert Anderson	Chevron
Brian Jennings	American Coalition For Ethanol
Pat Patterson	Novozymes

Panel 4	
Terry Branstad	Iowa Governor
Roger Zylstra	State Of Iowa
Mark Recker	ICGA
Richard Hansen	Citizen
Mark Leonard	Citizen
Randy Olson	Iowa Biodiesel Board

Panel 5	
Bob Goodlatte	U.S. Representative
Grant Menke	Iowa RFA
Mark Wigans	Citizen
Jeff Reamy	Phillips 66
Chris Bliley	Growth Energy
Dr. Allen Rider	25X25 Alliance National Steering Comm.

Panel 6	
Mike Cunningham	American Soybean Association
Katie Campbell	Actionaid USA
Paige Anderson	NACS
Maunce G. Fey	Citizen
Anne Germain	Environmental Industry Association
John Reese	Shell Oil Products

Panel 7	
Steven J. Shimber	Monroe Energy
Scott Fenwick	National Biodiesel Board
Glenn Johnston	Advanced Biofuels Association
Avery Ash	AAA
Alex Rindler	Environmental Working Group
Leticia Phillips	UNICA

Panel 8	
Bob Hutchinson	Maryland Grain Producers Association
Ron Marr	Minnesota Soybean Processors
John Mcknight	National Marine Manufacturers Association
Ramon M. Benavides	Global Renewable Stratgies And Consulting Llc
Kent Engelbrecht	ADM Biodiesel
Erick Lutt	Biotechnology Industry Organization

Panel 9	
Craig Willis	ADM Ethanol
David Whitehart	Marathon Petroleum Company
Curt Friesen	National Corn Growers Association
Dan Gilligan	Petroleum Marketers Assn Of America
Michael Whitney	Loves
Michele Boyd	Abengoa Bioenergy

Panel 10	
Brandon Hunnicutt	Nebraska Corn Growers Association
Josh Andrews	
Christine Harbin Hanson	Americans For Prosperity
Sandra Franco	Bingham Mccutchen Llp
Andrew W. Lavigne	American Seed Trade Assoc.
R. Brooke Coleman	Advanced Ethanol Council

Panel 11	
Alan Weber	Marc IV
Mitch Miller	National Corn Growers Association
Kenneth Haapala	Science And Environmental Policy Project
Jeff Oestmann	East Kansas Agri-Energy Llc
Vonnie Estes	Granbio
Kristin Pearson Wilcox	American Frozen Food Institue

Panel 12	
Steve Howell	Marc IV
Dave Howell	Indiana Corn Growers Association
Kris Kiser	Outdoor Power Equipment Institute, Inc.
Steffen Mueller	University Of Illinois At Chicago
Mark Beemer	Aventine REI
Aaron Walsh	Citizen

Panel 13	
Bryan Tallaferro	National Corn Growers Association
Bruce Lutes	Renewable Energy Group
Don Loren	Vets4Energy
Adam Nielsen	Illinois Farm Bureau
Sameerah Siddiqui	Oxfam America
Jan Ahlen	National Farmers Union

Panel 14	
Chris Hessler	AJW, Inc.
David Durham	Missouri Corn Growers Association
Mark Kent	Beltway Biodiesel
Nicole Palya Wood	Boatus
Ken Hartman	Illinois Corn Growers Association
Andrea Kavaler	LMC International

Panel 15	
Bill Bushong	National Corn Growers Association
Dayne A. Delahoussaye	Neste Oil Houston
Damon Wells	National Turkey Association
Kevin Anderson	Maryland Grain Producers Association
Bill Lapp	Conagra Foods
Steve Fogelsong	National Cattlemen's Beef Association

Panel 16	
Dennis Mcninch	Kansas Corn Growers Association
Timothy Keaveney	Hero BX Biodiesel
Mark Thomas	Ohio Corn And Wheat Growers Association
Pat O'Connor	NAFA Fleet Management
Scott Vinson	National Council Of Chain Restaurants
Brian Sui	National Resources Defense Council

Panel 17	
Chip Bowling	National Corn Growers Association
Jennifer Case	New Leaf Biofuel
Nick Yaksich	Association Of Equipment Manufactuers
Mike Clemens	North Dakota Corn Growers Association
Bruce Vollen	Midway Service
Gary Erscheid	Iowa Ethanol Producers Association

Panel 18	
Dwayne Schad	Missouri Corn Growers Association
Stephen D. Ward	VH Strategies
Pete Raskovic	Wisconsin Corn Growers Association
Kip Tom	Tom Farms
Thomas Corle	DONG Energy
Kevin Potas	POET DSM Advanced Biofuels

Panel 19	
Gary Hudson	Illinois Corn Growers Association
David Deramus	Bates White
Leslee Oden	National Turkey Association
Owen Wagner	LMC International
Robert E. Divers	United Power
Mike Morehouse	Indiana Corn Farmer

Panel 20	
H. Grant Troop	Pennsylvania Corn Growers Association
Gary Haer	REG Fuel
Randy Hughes	Wisconsin Corn Growers Association
Joseph A. Sincavage	
Mark Borer	Ohio Ethanol Producers Association
Charles Spano	

Panel 21	
Jamie Jamieson	Maryland Grain Producers Association
Tom Brooks	Western Dubuque Biodiesel
John Caupert	National Corn Growers Association
Kerry Fogarty	
Steve Pittman	Indiana Ethanol Producers Association
Rasma I. Zvaners	American Bakers Association

Panel 22	
Jay Schutte	Missouri Corn Growers Association
Robert Morton	Newport Biodiesel
Kyle Gilley	Poet
Rich Hanson	Missouri Corn Growers Association
Prabhsharan Singh	Citizen
Joel Brandenberger	National Turkey Association

Panel 23	
Joel Grams	Nebraska Corn Growers Association
Gene Gebolys	World Energy
Sparky Crossman	Virginia Grain Producers Association
Scott Lonier	Michigan Corn Growers Association
Tim French	Virginia Grain Producers Association
Rick Schwarck	Absolute Energy Llc

Panel 24	
Connie Lausten	Clausten LLC
John Davis	Ohio Corn And Wheat Growers Association
John Caupert	Illinois Corn Growers Association
Daniel Soltesz	Citizen
Wayne Presby	White Mountain Biodiesel
Ben Wootton	Keystone Biofuels, Inc.

Alphabetical list of panel assignments by first name

Aaron Walsh	Citizen	Panel 12
Adam Nielsen	Illinois Farm Bureau	Panel 13
Alan Weber	Marc IV	Panel 11
Alex Rindler	Environmental Working Group	Panel 7
Andrea Kavaler	LMC International	Panel 14
Andrew W. Lavigne	American Seed Trade Assoc.	Panel 10
Anne Germain	Environmental Industry Association	Panel 6
Anne Steckel	National Biodiesel Board	Panel 2
Avery Ash	AAA	Panel 7
Ben Wootton	Keystone Biofuels, Inc.	Panel 24
Bill Bushong	National Corn Growers Association	Panel 15
Bill Lapp	Conagra Foods	Panel 15
Bob Dinneen	Renewable Fuels Association	Panel 1
Bob Goodlatte	U.S. Representative	Panel 5
Bob Greco	American Petroleum Institute	Panel 2
Bob Hutchinson	Maryland Grain Producers Association	Panel 8
Brandon Hunnicutt	Nebraska Corn Growers Association	Panel 10
Brian Jennings	American Coalition For Ethanol	Panel 3
Brian Sui	National Resources Defense Council	Panel 16
Bruce Braley	U.S. Representative	Panel 2
Bruce Lutes	Renewable Energy Group	Panel 13
Bruce Vollen	Midway Service	Panel 17
Bryan Taliaferro	National Corn Growers Association	Panel 13
Charles Spano		Panel 20
Charles T. Drevna	American Fuel & Petrochemical Manufacturers	Panel 1
Chip Bowling	National Corn Growers Association	Panel 17
Chris Bliley	Growth Energy	Panel 5
Chris Hessler	AJW, Inc.	Panel 14
Christine Harbin Hanson	Americans For Prosperity	Panel 10
Connie Lausten	Clausten LLC	Panel 24
Craig Willis	ADM Ethanol	Panel 9
Curt Friesen	National Corn Growers Association	Panel 9
Damon Wells	National Turkey Association	Panel 15
Dan Gilligan	Petroleum Marketers Assn Of America	Panel 9
Daniel Soltesz	Citizen	Panel 24
Dave Howell	Indiana Corn Growers Association	Panel 12
David Deramus	Bates White	Panel 19
David Durham	Missouri Corn Growers Association	Panel 14
David Whikehart	Marathon Petroleum Company	Panel 9
Dayne A. Delahoussaye	Neste Oil Houston	Panel 15
Dennis Mcninch	Kansas Corn Growers Association	Panel 16
Don Loren	Vets4Energy	Panel 13
Dr. Allen Rider	25X25 Alliance National Steering Comm.	Panel 5
Dwayne Schad	Missouri Corn Growers Association	Panel 18
Erick Lutt	Biotechnology Industry Organization	Panel 8
Gary Eischeid	Iowa Ethanol Producers Association	Panel 17
Gary Haer	REG Fuel	Panel 20
Gary Hudson	Illinois Corn Growers Association	Panel 19
Gene Gebolys	World Energy	Panel 23
Glenn Johnston	Advanced Biofuels Association	Panel 7
Grant Menke	Iowa RFA	Panel 5

H. Grant Troop	Pennsylvania Corn Growers Association	Panel 20
Jamie Jamieson	Maryland Grain Producers Association	Panel 21
Jan Ahlen	National Farmers Union	Panel 13
Jan Koninckx	Dupont	Panel 2
Jay Schutte	Missouri Corn Growers Association	Panel 22
Jeff Johannesmeyer	Western Iowa Energy	Panel 3
Jeff Oestmann	East Kansas Agri-Energy Llc	Panel 11
Jeff Reamy	Phillips 66	Panel 5
Jennifer Case	New Leaf Biofuel	Panel 17
Jeremy I. Martin	Union Of Concerned Scientists	Panel 1
Joel Brandenberger	National Turkey Association	Panel 22
Joel Grams	Nebraska Corn Growers Association	Panel 23
John Bullock	Darling International, Inc.	Panel 1
John Caupert	National Corn Growers Association	Panel 21
John Caupert	Illinois Corn Growers Association	Panel 24
John Davis	Ohio Corn And Wheat Growers Association	Panel 24
John Mcknight	National Marine Manufacturers Association	Panel 8
John Reese	Shell Oil Products	Panel 6
John Urbanchuk	ABF Economics	Panel 2
Joseph A. Sincavage		Panel 20
Josh Andrews		Panel 10
Judd Hulting	Patriot Renewable Fuels, LLC	Panel 1
Katie Campbell	Actionaid USA	Panel 6
Ken Hartman	Illinois Corn Growers Association	Panel 14
Kenneth Haapala	Science And Environmental Policy Project	Panel 11
Kent Engelbrecht	ADM Biodiesel	Panel 8
Kerry Fogarty		Panel 21
Kevin Anderson	Maryland Grain Producers Association	Panel 15
Kevin Potas	POET DSM Advanced Biofuels	Panel 18
Kip Tom	Tom Farms	Panel 18
Kris Kiser	Outdoor Power Equipment Institute, Inc.	Panel 12
Kristin Pearson Wilcox	American Frozen Food Institue	Panel 11
Kyle Gilley	Poet	Panel 22
Leslee Oden	National Turkey Association	Panel 19
Leticia Phillips	UNICA	Panel 7
Mark Beemer	Aventine REI	Panel 12
Mark Borer	Ohio Ethanol Producers Association	Panel 20
Mark Kent	Beltway Biodiesel	Panel 14
Mark Leonard	Citizen	Panel 4
Mark Recker	ICGA	Panel 4
Mark Thomas	Ohio Corn And Wheat Growers Association	Panel 16
Mark Wigans	Citizen	Panel 5
Maurice G. Fey	Citizen	Panel 6
Michael Whitney	Loves	Panel 9
Michele Boyd	Abengoa Bioenergy	Panel 9
Mike Brown	National Chicken Council	Panel 1
Mike Clemens	North Dakota Corn Growers Association	Panel 17
Mike Cunningham	American Soybean Association	Panel 6
Mike Morehouse	Indiana Corn Farmer	Panel 19
Mitch Miller	National Corn Growers Association	Panel 11
Nick Yaksich	Association Of Equipment Manufactuers	Panel 17
Nicole Palya Wood	Boatus	Panel 14
Owen Wagner	LMC International	Panel 19
Paige Anderson	NACS	Panel 6
Pat O'Connor	NAFA Fleet Management	Panel 16

Pat Patterson	Novozymes	Panel 3
Paul Beckwith	Butamax	Panel 3
Pete Raskovic	Wisconsin Corn Growers Association	Panel 18
Peter Welch	U.S. Representative	Panel 3
Prabhsharan Singh	Citizen	Panel 22
R. Brooke Coleman	Advanced Ethanol Council	Panel 10
R. Timothy Columbus	SIGMA	Panel 2
Ramon M. Benavides	Global Renewable Stratgies And Consulting Llc.	Panel 8
Randy Hughes	Wisconsin Corn Growers Association	Panel 20
Randy Olson	Iowa Biodiesel Board	Panel 4
Rasma I. Zvaners	American Bakers Association	Panel 21
Rich Hanson	Missouri Corn Growers Association	Panel 22
Richard Hansen	Citizen	Panel 4
Rick Schwarck	Absolute Energy Llc	Panel 23
Robert Anderson	Chevron	Panel 3
Robert E. Divers	United Power	Panel 19
Robert Morton	Newport Biodiesel	Panel 22
Roger Zylstra	State Of Iowa	Panel 4
Ron Marr	Minnesota Soybean Processors	Panel 8
Sameerah Siddiqui	Oxfam America	Panel 13
Sandra Franco	Bingham Mccutchen Llp	Panel 10
Scott Fenwick	National Biodiesel Board	Panel 7
Scott Lonier	Michigan Corn Growers Association	Panel 23
Scott Vinson	National Council Of Chain Restaurants	Panel 16
Sparky Crossman	Virginia Grain Producers Association	Panel 23
Steffen Mueller	University Of Illinois At Chicago	Panel 12
Stephen D. Ward	VH Strategies	Panel 18
Steve Fogelsong	National Cattlemen's Beef Association	Panel 15
Steve Howell	Marc IV	Panel 12
Steve Pittman	Indiana Ethanol Producers Association	Panel 21
Steven J. Shimber	Monroe Energy	Panel 7
Terry Branstad	Iowa Governor	Panel 4
Thomas Corle	DONG Energy	Panel 18
Tim French	Virginia Grain Producers Association	Panel 23
Timothy Keaveney	Hero BX Biodiesel	Panel 16
Tom Brooks	Western Dubuque Biodiesel	Panel 21
Vonnie Estes	Granbio	Panel 11
Wayne Presby	White Mountain Biodiesel	Panel 24

○