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BIOFUELS IMPACT ON FOOD PRICES

HEARING

BEFORE THE

COMMITTEE ON ENERGY AND NATURAL RESOURCES UNITED STATES SENATE

ONE HUNDRED TENTH CONGRESS

SECOND SESSION

TO

RECEIVE TESTIMONY ON THE RELATIONSHIP BETWEEN THE UNITED STATES' RENEWABLE FUELS POLICY AND FOOD PRICES

JUNE 12, 2008

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BIOFUELS IMPACT ON FOOD PRICES

THURSDAY, JUNE 12, 2008

U.S. SENATE,
COMMITTEE ON ENERGY AND NATURAL RESOURCES,
Washington, DC.

The committee met, pursuant to notice, at 2:15 p.m., in room SD–366, Dirksen Senate Office Building, Hon. Jeff Bingaman, chairman, presiding.

OPENING STATEMENT OF HON. JEFF BINGAMAN, U.S. SENATOR FROM NEW MEXICO

The CHAIRMAN. The hearing will come to order.

Thank you all for coming here today to discuss our Nation's biofuels policy and how that policy is affecting domestic and global food prices. The recent increase in commodity prices, with food and fuel prices at historic highs, highlights the importance of trying to be sure we get our policies right. We called today's hearing in an effort to do just that, to make sure that those policies make sense.

Last month, I asked the Secretaries of Agriculture and Energy a series of questions about the impact of the Renewable Fuels Standard on domestic and international food and fuel prices. Those questions were intended to establish some of the facts on this issue so that we could base today's discussion on facts rather than on agenda-driven calculations that we see more often than not.

The answers that I received from the Departments of Agriculture and Energy indicate that U.S. biofuels policy explains between 4 and 5 percent of the 45 percent global increase in food prices this last year. At least that is my interpretation of what they have said. If that is wrong, we can clarify that. At the same time, biofuels have increased the U.S. fuel supply and are reducing the price that Americans pay at the gas pump by somewhere between 20 and 35 cents per gallon.

As we continue on this path toward expanding our alternatives to gasoline and reducing its cost, we obviously need to find a way to eliminate any impact on global food prices. The intent of the Renewable Fuels Standard that was enacted in December of last year, December 2007, is to move beyond our current technologies and to technologies that have no implications for our food supply.

I think the critics of our current biofuels policy do not question the validity of our end goal of a healthy second-generation biofuels industry, but rather question our path for arriving at that end goal. Our current path does require increased use of existing biofuels, including corn ethanol and soy-based biodiesel.

We need to consider what altering that path now would do to industry that is attempting to respond to the Government policies we have already put in place and if there would be negative implications for second-generation fuels. It is a fact that many of the companies that are expected to be next-generation biofuel industry leaders, especially for cellulosic ethanol, are current industry leaders in corn ethanol production.

At the same time, we need to be mindful of any unintended consequences of our biofuels policy. No one wants our biofuels policy to increase the prices that Americans are paying at the grocery store. We also, of course, need to ensure that our policies, including but not limited to our biofuel policies, are not negatively impacting the world's poor who are most vulnerable to food price increases. I take seriously the United Nations call for further study on the topic of biofuels and look forward to constructive thoughts on how we can create a more sustainable global biofuels industry.

Let me just defer to Senator Domenici for his statement at this time.

[The prepared statements of Senators Bingaman and Salazar follow:]

PREPARED STATEMENT OF HON. JEFF BINGAMAN, U.S. SENATOR FROM NEW MEXICO

Thank you all for coming today to discuss our nation's biofuels policy, and how that policy is affecting domestic and global food prices. The recent increase in commodity prices, with food and fuel prices at historic highs, highlights the importance of getting our policies right. I called today's hearing in an effort to help us do just that: to make sure we are getting our biofuels policy right.

Last month, I asked the Secretaries of Agriculture and Energy a series of questions about the impact of the Renewable Fuel Standard on domestic and international food and fuel prices. Those questions were intended to establish some of the facts on this issue, so that we could base today's discussion on facts, rather than the agenda-driven calculations that we see more often than not.

The answers that I have received from the Departments of Agriculture and Energy indicate that U.S. biofuels policy explains between 4 and 5 percent of the 45 percent global increase in food prices in the last year. At the same time, biofuels have increased the U.S. fuel supply and are reducing the prices that Americans pay at the gas pump by between 20 and 35 cents per gallon.

As we continue on this path toward expanding our alternatives to gasoline and reducing its cost, we obviously need to find a way to eliminate any impact on the global food prices. The intent of the Renewable Fuel Standard that was enacted in December 2007 is to move beyond our current technologies, to technologies that have no implications for our food supply.

I think the critics of our current biofuels policy do not question the validity of our end goal of a healthy second-generation biofuels industry, but rather question our path for arriving at that end goal. Our current path does require increased use of existing biofuels, including corn ethanol and soy-based biodiesel.

I am concerned that altering that path now would not only be unfair to the industry that is responding to the government policies that have already been put in place, but also would have negative implications for second-generation fuels. It is a fact that many of the companies that are expected to be next-generation biofuel industry leaders, especially for cellulosic ethanol, are current industry leaders in corn ethanol production. To hurt those companies' bottom lines now would endanger their investments in expanding their business to include next-generation production.

I also suspect that investment in other kinds of next-generation technology would suffer, as investors would feel less confident of Congress's commitment to its biofuels policies. I believe that many next-generation fuels hold great promise for further diversifying our fuel supply. As we diversify away from biofuel feedstocks that compete with our grain supply, we also diversify the geographic production areas beyond the current base in the Midwest.

In my home state of New Mexico, which has no corn ethanol production, limited sorghum-ethanol production, and very small amounts of biodiesel production, is an example of how the geography of biofuels production can change. We are hopeful

that we will be home to the country's first biobutanol plant, which could be located near Portales, New Mexico, and could use sweet sorghum as a feedstock. We also understand that New Mexico is one of the most promising states in the U.S. for large-scale algae production, which we will hear more about in today's hearing. We need the market certainty that comes with the existing renewable fuels mandate in order to realize the benefits of this next-generation industry.

At the same time, I do think we need to be mindful of any unintended consequences of our biofuels policy. No one wants our biofuels policy to increase the prices that Americans are paying at the grocery store—although I think we can agree that this domestic price increase is to some degree offset by the savings we're seeing at the fuel pump. But we must also ensure that our policies, including but not limited to our biofuels policies, are not negatively impacting the world's poor, who are most vulnerable to food price increases. I take seriously the United Nations call for further study on the topic of biofuels, and look forward to constructive thoughts on how we can create a more sustainable global biofuels industry.

PREPARED STATEMENT OF HON. KEN SALAZAR, U.S. SENATOR FROM COLORADO

Mr. Chairman and Ranking Member Domenici, thank you for holding this critical hearing on the relationship between our nation's renewable fuels policy and food prices. Obviously fuel and gasoline prices are front and center in our minds today as families across the country are struggling to cope with spiraling fuel costs. Globally, however, there is an emerging food crisis that threatens to affect the lives of millions of the world's poorest citizens. It is our responsibility to evaluate whether our biofuels policies are impacting food prices.

As I have said repeatedly over the last four years there is no quick fix to this enormous problem, but there are a number of things we can do to stem the tide of rising fuel costs in the long-run. We need to be improving our energy efficiency, investing in technologies, and developing our clean energy economy. And I am proud that under your and Sen. Domenici's leadership this committee has produced two landmark energy bills that are huge steps in the right direction in terms of righting our nation's energy policy and breaking our addiction to foreign oil.

At the end of 2007, Congress passed legislation to increase fuel efficiency standards in cars and light trucks by over 40 percent by 2020. This will save over 1.1 million barrels of oil a day. The bill we passed last December, the Energy Independence and Security Act, is spurring rapid development and deployment of the next generation of biofuels, such as cellulosic ethanol. The bill quintupled the existing renewable fuels standard to 36 billion gallons by 2022, 21 billion of which must be from advanced biofuels, such as cellulosic ethanol. That is more than enough to offset our oil imports from Saudi Arabia, Iraq, and Libya combined.

I was also proud of the work we did in the Farm Bill to spur cellulosic biofuels production. Cellulosic biofuels have the potential to displace 3 billion barrels of oil annually, equivalent to 60 percent of our country's yearly consumption of oil in the transportation sector, without affecting our need for food, feed or fiber, and DOE scientists believe have the potential to dramatically reduce carbon pollution. The Farm Bill includes a provision I sponsored that provides a $1.01/gallon tax credit for the production of cellulosic biofuels. It is the first incentive for cellulosic biofuels of its kind.

Biofuels are an essential and critical part of our strategy to reduce our dependence on foreign oil. Recently many have attributed the rising cost of food worldwide to the increased use of biofuels, and corn ethanol in particular. Some are even calling for a repeal of the expansion of our renewable fuels standard that was a cornerstone of last year's Energy Independence and Security Act. I believe firmly that we must not lose our resolve.

The so-called "food vs. fuel" issue has been a part of the discussion of biofuels from day one, and today's full-throated debate is an important opportunity to engage in a healthy discussion of the future of biofuels. But as I'll explain, ethanol production is not driving food prices up. In the long run, pushing forward with the RFS and the development of cellulosic biofuels—biofuels that are made from various waste feedstocks—is one of the most responsible things we can do to reduce our dependence on foreign oil.

Three principal factors have driven rising food prices, and ethanol production isn't one of them. First, global demand for grains, particularly from China and India, is rising. Second, global supply has slumped badly due to serious drought conditions in several areas of critical agricultural production. U.S. producers are doing everything they can to boost supplies. Not counting corn used for ethanol production, we produced 17% more corn food product and exported 23% more food product overall

in 2007 than in 2006. Furthermore, Ed Lazear, Chairman of the President's Council of Economic Advisors, stated recently that ethanol accounts for less than 3 percent of the increase in global food prices.

The third major factor driving increased food prices is the rising cost of oil. Petroleum costs are embedded in every part of the global food supply chain. Recent studies by USDA reveal that for every dollar we spend on food, only twenty cents is the cost of the food product itself. The other 80 cents or so are the costs of labor, energy, transportation, etc. Simply put there is a broad consensus that in the global marketplace, U.S. corn production alone does not set the price for corn and that biofuels production has a negligible impact on the prices of wheat, rice, and other food commodities.

With the price of oil spiraling higher, it is easy to lose sight of the fact that gas prices would be even higher today if not for biofuels. Merrill Lynch estimates that we would be paying 15 percent higher prices at the pump without current domestic biofuels on the market. In addition, studies are showing that, as a result of our renewable fuels standard enacted in 2005, U.S. oil imports recently declined for the first time in a quarter century.

In my view, biofuels are a centerpiece of our quest for energy independence and we must stay the course with the RFS. I am eager to engage in this discussion and to hear the perspectives from our distinguished panel on these critical issues. Thank you, Mr. Chairman.

Senator DOMENICI. Mr. Chairman, in order to expedite the hearing, since we have a number of places to go and still want to do this committee justice, I would ask that my statement be put in the record, provided we can just proceed after this to the witnesses. Is that what would happen?

The CHAIRMAN. That is correct since I do not anticipate any other opening statements. So we will put your statement in the record.

[The prepared statement of Senator Domenici follows:]

PREPARED STATEMENT OF HON. PETE V. DOMENICI, U.S. SENATOR FROM NEW MEXICO

Thank you, Mr. Chairman, for calling this hearing on a topic that you and I have worked closely on in recent years. I am very proud of the work that this committee has done to promote the production of domestic biofuels. Increasing their availability and usage could help resolve some of our most serious energy challenges.

Late last year we passed the Energy Independence and Security Act, a bill that will significantly strengthen our nation's energy security. One of its most important provisions was an expansion of the Renewable Fuel Standard, which we first established in the Energy Policy Act of 2005.

Much has changed since the 2005 standard was put into place. In 2005, we thought of renewable fuels as fuel additives. But last year, in his State of the Union Address, the President laid out his "Twenty in Ten" initiative, which inspired people to think of renewable fuels as full-fledged transportation fuels. Our re-evaluation and enhancement of the renewable fuels standard in 2007 reflects our strong desire to promote development of fuels that will reduce the nation's reliance on foreign oil.

We have been on the Senate floor for the past week talking about our energy crisis. I have stressed that we need to produce all the domestic oil and gas that we can, and as soon as we can, not only to dampen prices, but as a bridge to the future where we envision our nation's freedom from foreign sources of energy. While some biofuels technology, like corn ethanol, is available now to help build that bridge, we must also move forward with advanced biofuels, including cellulosic ethanol, if we're going to get to the other side of the bridge where biofuels, nuclear energy, wind, solar, and other renewables will secure our energy future, free of foreign sources. In the near term, wholesale ethanol is currently about one dollar cheaper than wholesale gasoline. As more biofuels are produced, as more service stations offer them for purchase, and as more cars are able to run on them, we should expect even more progress in decreasing fuel prices and emissions. But the purpose of this hearing is not to look at the benefits that biofuels have for our energy supply and security. We have already concluded that the benefits are legion. Instead, we're here today to examine what role, if any, biofuels are playing in recent price increases for agricultural commodities. Many in the media, along with other critics of biofuels, have been quick to blame increases in the price of corn on greater demand for eth-

anol. America's biofuels policy has been called into question, and the "food versus fuel" debate has now led to a number of formal requests to suspend or repeal the Renewable Fuel Standard.

Most experts point out that there are multiple factors contributing to food price increases. Those include higher energy prices, soaring global demand for commodities, droughts, the weakening of the dollar, and poor agricultural policies around the world.

A number of studies have examined the relationship between domestic biofuels production and global access to food. I hope that our witnesses today will help in our assessment of these studies and our search for answers as to whether increased production of biofuels will exacerbate world hunger.

We want to ensure that the expanded RFS promotes a robust biofuels industry here in the United States. We want to make sure that we take the right approach to facilitate the implementation of that program, and provide a smooth transition to greater integration of biofuels into our energy supply mix. But as we do those things, we also want to be sure that we do not create other problems that will in turn need to be dealt with.

I look forward to the testimony from today's witnesses, and hope to learn more about what we can do to ensure that we meet these objectives.

The CHAIRMAN. Let me just alert all the witnesses that we do have a vote scheduled here at 3 o'clock. So we hope by then we can have everyone's testimony in, and then we will probably have a short recess and return for some of the questions that I am sure people will have.

Let me just introduce our witnesses. First is Alexander Karsner who is the Assistant Secretary in the Office of Energy Efficiency and Renewable Energy in the Department of Energy. He's a regular witness here, and we appreciate him being here again today. Joseph Glauber, who is the Chief Economist with the Department of Agriculture. We appreciate you being here very much. Joe Outlaw, who is the Co-Director of the Agricultural and Food Policy Center in the Department of Agricultural Economics in College Station, Texas. Thank you for being here. Joachim von Braun. I am getting you a little out of order here. I guess the next in order of the way you are seated is Jason Pyle. Jason is the Chief Executive Officer with Sapphire Energy out of San Diego, California. Thank you for coming. Joachim von Braun is the Director General of International Food Policy with the Research Institute here in Washington, DC. Thank you very much for being here. Jack Huttner, who is the Vice President of Biorefinery Business Development in Genencor out of Rochester, New York.

Thank you all for being here, and if each of you could take 5 or 6 minutes and summarize the main points you think our committee needs to understand and we will put your full statements in the record as if read. Let us start with you, Andy. If you will just go ahead. Thank you.

STATEMENT OF ALEXANDER KARSNER, ASSISTANT SECRETARY, ENERGY EFFICIENCY AND RENEWABLE ENERGY, DEPARTMENT OF ENERGY

Mr. KARSNER. Mr. Chairman, Ranking Member Domenici, members of the committee, thanks for the opportunity to appear before you today to discuss the sustainable contribution that biofuels make to the Nation's fuel supply in the context of the food versus fuel debate. All of us recognize that rising food and fuel prices are an important pocketbook issue for American consumers. We also recognize the national and economic security importance of ad-

dressing our dangerous addiction to oil, as well as the urgency of developing clean alternative fuels that reduce greenhouse gas emissions and enhance our environmental well-being. Our biofuels policy and national program make important contributions with consideration and inclusion of all of these goals.

Unfortunately, recent media coverage of ethanol and food prices has created a number of misconceptions about biofuels and fed inaccuracies into the global and national dialog. The most prominent recurring myths are that ethanol does not improve the energy balance, that it has a net negative impact on the environment, and that it is a primary contributor to rising food prices. We appreciate the opportunity to address these views and continue to invite all serious and interested parties to engage with the depth of experience that our national laboratories and scientists can provide on the subject.

Data would suggest that domestic biofuels are not in and of themselves creating a food security issue and in fact are only a small fraction of the increase in food prices. Importantly, biofuels offer a number of significant energy security and environmental benefits that will continue to grow, assuming a predictable policy environment as the technology for next-generation biofuels evolves. Of course, next-generation biofuels are exclusively what the Department of Energy invests in.

In the U.S. today, conventional ethanol has a positive energy balance and this balance is measurably and constantly improving with new technologies and efficiencies. According to Argonne National Laboratory, each gallon of ethanol produced from corn today is estimated to deliver on average 25 percent more energy than the energy that is used to produce it.

DOE's current estimates find that ethanol also results in approximately 20 percent fewer greenhouse gas emissions compared with gasoline. According to Argonne National Laboratory, with improved efficiency and the use of renewable energy in production, this reduction could potentially reach up to 52 percent, which has recently been demonstrated. The positive energy balance and the potential GHG reduction from cellulosic ethanol is, of course, far greater still.

With regard to food price impacts, most preliminary analyses suggest that present feedstock demand for domestic biofuels plays only a small role in global food supply and pricing. Moreover, the food price impact of domestic biofuels on U.S. consumers is even smaller since the farm price of commodities accounts for less than 20 percent of U.S. consumers' food costs.

Of course, there is significant offset and compensation for some of this through the constraint on retail fuel prices at the gasoline pump which we conservatively estimate to be 20 to 35 cents per gallon savings for the use of ethanol every time we fill up. Independently verified and peer-reviewed studies suggest the number is far higher.

To help meet our long-term energy needs, this committee has ensured that the Department of Energy's biomass-related activities are 100 percent designed and dedicated to move toward non-food, nonedible feedstocks in a renewable and sustainable way. Primarily, this is from waste streams and fast-growing sustainable en-

ergy crops that have the potential to have an even greater positive environmental and energy security impact.

Cellulosic biofuels are expected to deliver four to six times as much energy as what is required to produce them. Additionally, DOE research has shown that cellulosic feedstocks can reduce life-cycle greenhouse gas emissions by up to 86 percent when compared with gasoline.

DOE's research, development, deployment, and commercialization activities exclusively support the development of cellulosic and advanced biofuels. This is consistent with EPACT section 932. So the Department is investing up to $385 million over the next 4 years in cost-shared, integrated, commercial-scale biorefineries that are projected to produce up to 130 million gallons of ethanol from cellulosic biomass.

In addition, DOE is investing up to $200 million over the next 5 years in smaller 10 percent scale cost-shared biorefineries that will demonstrate a range of advanced biochemical and thermochemical conversion platforms and technologies and use a wide range of sustainable cellulosic feedstocks.

With continued technological advances, cellulosic ethanol and other advanced biofuels will, in fact, help our Nation reap greater benefits in the future, complementing the bipartisan, bold energy initiatives that the President and Congress have put in place to enhance our Nation's energy security and economy.

The food and fuel pricing issues, including aspects of sustainability, need increased clarity and further dialog as they are, of course, important and complex as we grow alternatives to a carbon-based fossil fuel economy. We would again caution, therefore, against hasty judgments based on insufficient assumptions, limited information, or the interest of particular parties or groups. Many analysts both within and outside of the Government are currently working to analyze these issues on a scientific and economic basis, and one certainty is that our data, as well as the technologies and the performance, will continue to improve substantially in the months and the years ahead.

Mr. Chairman, thank you for holding this important hearing and your continued leadership offering us perspective and proportionality on these issues. I appreciate the leadership of the committee in this and the opportunity to address the current debate of the role of biofuels as part of our Nation's energy portfolio.

This concludes my prepared statement and I am happy to answer any questions that you may have.

[The prepared statement of Mr. Karsner follows:]

PREPARED STATEMENT OF ALEXANDER KARSNER, ASSISTANT SECRETARY, ENERGY EFFICIENCY AND RENEWABLE ENERGY, DEPARTMENT OF ENERGY

Mr. Chairman, Ranking Member Domenici, Members of the Committee, thank you for the opportunity to appear before you today to discuss the sustainable contribution that biofuels can make to the Nation's fuel supply in the context of the U.S. Renewable Fuel Standard (RFS) and the food versus fuel debate. All of us recognize that high food prices and high gasoline prices are important "pocketbook" issues for American consumers. We also recognize the national and economic security importance of reducing our dependence on oil as well as the urgency of developing new fuels that will reduce greenhouse gas emissions. Our biofuels policy makes important contributions to each of these goals.

FEDERAL COMMITMENT TO SUSTAINABLE BIOFUELS DEVELOPMENT

As part of the 2007 State of the Union Address, President Bush called on Congress to significantly increase the use of advanced biofuels as part of the Twenty in Ten Initiative. Congress passed and the President signed into law the Energy Independence and Security Act of 2007 (EISA), requiring that U.S. transportation fuels contain at least nine billion gallons of renewable fuels in 2008, growing to 36 billion gallons in 2022. Of the quantity required in 2022, at least 21 billion gallons must be advanced biofuels (non-corn), and of that 21 billion, 16 billion gallons must be cellulosic biofuels; ethanol from corn is capped at 15 billion gallons. The Department of Energy is committed to the goal of developing cost-competitive cellulosic ethanol by 2012. Our efforts will help spur the resources, technologies, and systems at the rate and scale needed to enable this mandate to be met, and impact climate change. To that end, DOE and other federal agencies are working to develop diverse, non-food feedstocks that require little water or fertilizer, and to foster sustainable agricultural and forestry practices. The Administration is also committed to developing a methodology, as required by EISA, to assess the life-cycle impacts of biofuels production, from feedstocks to vehicles, and analyze the impacts to land use and soil health, water use, air quality, and greenhouse gas emissions. Many of these issues are also being addressed through the senior-level Biomass R&D Board Sustainability Working Group, which the Departments of Energy (DOE) and Agriculture (USDA) and the Environmental Protection Agency (EPA) jointly chair.

Together, DOE, USDA, and EPA continue to be committed to collecting and presenting accurate data, projecting potential impacts, and initiating the necessary and appropriate actions to ensure the sustainable growth of biofuels. To that end, DOE, USDA, and EPA have significantly ramped up our analytical efforts to ensure that we proceed with caution but also determination. The agencies will continue to work together as we undertake our respective responsibilities under Title II of EISA.

DOE is also leveraging other partnerships to support the RFS goals. The Department is investing up to $385 million total over four years (FY 2007-FY 2010, subject to appropriation) in cost-shared, integrated commercial-scale biorefineries that are projected to produce up to 130 million gallons of ethanol from cellulosic biomass in four years when they are fully operational. In addition, DOE is investing up to $200 million over five years (FY 2007-FY 2011, subject to appropriation) in smaller (10% of commercial scale) cost-shared biorefineries that will demonstrate a wider range of advanced biochemical and thermochemical conversion technologies and use a wide array of cellulosic feedstocks.

In addition, the Department's Office of Science has recently established three major new DOE Bioenergy Research Centers—led by the University of Wisconsin-Madison, Oak Ridge National Laboratory, and Lawrence Berkeley National Laboratory, respectively—which are bringing together top scientists and researchers in an effort to accelerate the transformational breakthroughs in basic science needed to make next-generation cellulosic biofuels cost-effective. The Department plans to invest over $400 million in total in this effort through FY 2012.

MISCONCEPTIONS ABOUT BIOFUELS: ENVIRONMENT, GASOLINE PRICES, AND FOOD SUPPLY

Recent press coverage of ethanol and food prices has created a number of misconceptions about biofuels. The most prominent of these misconceptions are that ethanol does not improve the energy balance, that it has a negative impact on the environment, and that it contributes to rising food prices. We appreciate the opportunity to address these views. We believe biofuels are not creating a food security issue and are only a small part of increased food prices. In addition, biofuels offer a number of important energy and environmental benefits that will grow as the technology for next generation biofuels comes online.

Today's corn-based ethanol has a positive energy balance—that is, the energy content of ethanol is greater than the fossil energy used to produce it—and this balance is constantly improving with new technologies. According to Argonne National Laboratory, each gallon of ethanol produced from corn today is estimated to deliver on average 25 percent more energy than would the fossil energy that is used to produce it.[1] Over the last 20 years, the amount of energy needed to produce ethanol from corn has significantly decreased because of improved farming techniques, more efficient use of fertilizers and pesticides, higher-yielding crops, and more energy-effi-

[1] Source: Wang et al, "Life-cycle energy and greenhouse gas emission impacts of different corn ethanol plant types," Environmental Research Letters, May 2007.

cient conversion technology.[2] A few scholars have conducted studies that allege a negative energy balance for ethanol; however, these fail to take into account the energy use avoided because of the production of co-products such as Distiller's Grain, a high-protein animal feed.[3]

DOE's current estimates find that ethanol also results in fewer greenhouse gas (GHG) emissions than gasoline, and is fully biodegradable, unlike some fuel additives. DOE's analysis shows that today, on a life-cycle basis, corn ethanol produces approximately 20 percent fewer GHG emissions than gasoline. According to Argonne National Laboratory, with improved efficiency and use of renewable energy, this reduction could reach 52 percent.[4] The positive energy balance and the potential GHG reduction from cellulosic ethanol is far greater, as I will discuss later in this testimony. It is important to note that the lifecycle greenhouse gas emissions estimates discussed here do not reflect indirect land use impacts requirements as specified in EISA. Life-cycle analyses involve a number of complicating factors, such as direct and indirect land use effects, and DOE is working with EPA as they develop a lifecycle methodology that meets the EISA definition.

Further evidence of ethanol's environmentally sound contribution to the fuel supply is that vehicles fueled with the ethanol-blended fuels currently in the market—whether E10 or E85—must meet EPA's stringent tailpipe emission standards. Ethanol has proven to be a safe, high-performance replacement for fuel additives such as MTBE.

Blending ethanol and gasoline has led to questions on its potential impact on gasoline prices. However, evidence from an Iowa State study suggests that without ethanol, gasoline prices would be higher.[5] According to this analysis, even during the period in which MTBE was being phased out (2006) and ethanol prices were very high, had ethanol not been available, gasoline prices would have been even higher.[6]

Ethanol is currently less costly than the refiner's average mix of gasoline components. The cost of ethanol to refiners has been lower than the wholesale cost of conventional gasoline.[7] In fact, as of the week of May 26, 2008, the gap was close to a $1.00/gallon difference; even adjusting for energy content, ethanol is cost-competitive. According to EIA, if we had not been blending ethanol into gasoline, gasoline prices would be between 20 cents per gallon to 35 cents per gallon higher.[8]

With regard to food price impacts, our preliminary analysis suggests that current biofuels-related feedstock demand plays only a small role in global food supply and pricing.[9] Moreover, the impact of biofuels on U.S. consumers is even smaller since the farm price of commodities accounts for less than 20 percent of U.S. consumers' food costs.[10]

Numerous studies have found that world food prices have increased due to many factors, including high oil prices (used both in transportation and production of food); droughts in some key exporting countries, including Australia; increased demand as emerging economies grow and their populations consume better diets and eat more meat; a reduction of global agricultural R&D; and other factors.

In 2007, about a quarter of the U.S. corn crop went to biofuels production, but this fact can be misleading in isolation. Only the starch from the corn kernel is used to produce the fuel, leaving the co-product Distiller's Grain. These Distiller's Grains are used as animal feed which is valued by its protein content, which is significantly higher by weight than the protein content of corn. As a result, almost one-third of each ton of corn used for ethanol production is recovered as a livestock feed. Thus, in actuality, only about one-sixth of the U.S. corn crop by mass is used in fuel pro-

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[2] Source: May Wu, Center for Transportation Research, Argonne National Laboratory, "Analysis of the Efficiency of the U.S. Ethanol Industry 2007." http://www.ethanolrfa.org/objects/documents/1656/argonne__efficiency__analysis.pdf.

[3] See metaanalysis supportive of this statement: Farrell et al, "Ethanol Can Contribute to Energy and Environmental Goals," Science Magazine, January 2006.

[4] Source: Wang et al, "Life-cycle energy and greenhouse gas emission impacts of different corn ethanol plant types," Environmental Research Letters, May 2007.

[5] Source: http://www.card.iastate.edu/publications/DBS/PDFFiles/08wp467.pdf.

[6] Historical spot conventional regular gasoline data from EIA 2003-2007, Spot ethanol prices at Chicago Board of Trade 2003-2007, Oil Price Information Services (OPIS).

[7] Based on Oil Price Information Service data for spot prices of ethanol (after rebate) and conventional gasoline.

[8] This estimate relies on data on the current price difference between ethanol and gasoline and the elasticity of supply for petroleum. Consequently, a range is presented.

[9] Source: http://www.usda.gov/wps/portal/!ut/p/__s.7__0__A/7__0__1OB?contentidonly=true&contentid=2008/05/0130.xml, http://www.afpc.tamu.edu/pubs/2/515/RR-08-01.pdf.

[10] Source: USDA's Economic Research Service.

duction. Moreover, it is important to note that U.S. corn exports have been stable throughout the past decade, and have, in fact, increased recently.[11]

Furthermore, our Nation's enhanced farming techniques and continued improvement in plants and seeds will likely enable our supply to grow. Yield increases could enable us to double our corn based ethanol production over the next ten years while maintaining corn availability for other uses.[12]

Finally, increased global food demand as living standards and diets improve is an important factor in explaining increases in commodity prices, and is unrelated to biofuels. According to the UN, global economic growth has driven up prices for all commodities.[13]

THE POTENTIAL FOR CELLULOSIC ETHANOL AND OTHER ADVANCED BIOFUELS

Evidence suggests that corn ethanol is not the primary driver affecting worldwide food prices. To help meet our long-term energy needs, the Department's biomass research and development activities are designed to move toward non-food feedstocks that have the potential to have an even greater positive environmental impact.

The biomass feedstocks of today include grains (corn, sorghum, wheat), as well as oilseeds and plants (such as soybeans). The feedstocks of tomorrow will come from a variety of sources such as wastes and residues and fast-growing energy crops. These future feedstocks will consist of agricultural residues like stalks, stems, and other crop wastes, as well as forest resources such as wood waste, forest thinnings, and small-diameter trees. Examples of energy crops include switchgrass, miscanthus, and hybrid poplar trees, in addition to oilseeds and oil crops like algae and jatropha. Some of these promising energy crops can grow on marginal soils, and they can actually sequester carbon. Forest resources, green wastes, and sorted municipal solid waste will also play a role.

As I noted earlier, research to date suggests that today's ethanol has a positive energy balance—that is, the energy content of corn ethanol is greater than in the fossil energy used to produce it. In the future, cellulosic ethanol is expected to improve upon this by delivering four to six times as much energy as needed to produce it.[14] Additionally, DOE research has shown that cellulosic feedstocks can reduce lifecycle greenhouse gas emissions by 86 percent compared to gasoline.[15]

A number of market and technical barriers to advanced biofuel production exist. Fortunately, Congress and the Administration have taken steps to diminish these obstacles, and we are poised to make even more progress. Market barriers include a lack of cellulosic feedstock market and high capital costs. The main technical barriers are a lack of cost-competitive conversion technologies, a lack of feedstock collection equipment, the absence of standard cellulosic biofuels production blueprints, and the lack of fully integrated large-scale systems. As part of the effort to overcome these hurdles, EISA helps establish a market demand for cellulosic biofuels. EISA also provides grants for research and development projects; and demonstration and commercial application of biofuel production technologies, including important research on plants, enzymes, and microbes. These efforts are working toward cost reductions in conversion technologies, and cost-shared biorefinery projects will help validate approaches.

We have made significant advances, but there is more that would be helpful to support the development of biofuels—for example, expansion of the use of woody biomass and increased penetration of flex-fuel vehicles into the market. Additionally, when developed in parallel to E85 infrastructure, intermediate ethanol-gasoline blends (those between E10 and E85) could also help enable continuous uninterrupted growth in production. The research we are supporting today to produce advanced biofuels beyond ethanol and biodiesel may also eventually help the industry. With continued technological advances at all levels, ethanol can help our Nation reap greater benefits in the future, complementing the President's bold energy initiatives, which seek to increase our Nation's energy and economic security.

CONCLUSION

The food and fuel pricing issues about which you have raised questions are important and complex. We would again caution, therefore, against hasty judgments.

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[11] Source: USDA National Agricultural Statistics Service.
[12] Source: Historical Trend data from USDA.
[13] Source: UNCTAD database: http://www.unctad.org/Templates/Page.asp?intItemID=1584&lang=1.
[14] Source: Wang et al, "Life-cycle energy and greenhouse gas emission impacts of different corn ethanol plant types," Environmental Research Letters, May 2007.
[15] Ibid.

Many analysts both within and outside of Government are currently working to analyze these issues and the one certainty is that our data will improve substantially in the months ahead.

Mr. Chairman, thank you again for holding this important hearing. I appreciate your leadership in this matter as well as this opportunity to address the current debate over the role of biofuels in our Nation's energy portfolio. This concludes my prepared statement, and I would be happy to answer any questions the Committee Members may have.

The CHAIRMAN. Thank you very much.

Dr. Glauber, go right ahead.

STATEMENT OF JOSEPH GLAUBER, CHIEF ECONOMIST, DEPARTMENT OF AGRICULTURE

Mr. GLAUBER. Thanks very much. Mr. Chairman, Senator Domenici, and members of the committee, thank you for the opportunity to discuss the effects of the expansion in biofuel production in the U.S. on commodity markets and food prices both here and abroad.

In the U.S., two commodities, corn and soybean oil, account for over 90 percent of biofuels production. From April 2007 through April 2008, corn and soybean prices rose by over 50 percent in response to a variety of factors, including domestic and global economic growth, global weather, rising input costs for energy, international export restrictions, and new product markets, particularly biofuels. Over the same period, global food commodity prices, as measured by the IMF, rose by over 45 percent and retail food prices in the U.S. increased by more than 5 percent.

There has been much confusion in the media over the price effects of biofuels. Some studies have attributed most and, in some instances, all of the increase in global food prices and retail food prices in the U.S. to biofuel production, while other studies have reported considerably smaller effects. I believe it is important to distinguish between, one, the effects of biofuels on feedstock prices such as corn or soybean oil, which tend to be quit large; two, the more general effects on a bundle of world commodity prices, such as measured by the IMF's Global Food Commodity Price Index, which tend to be somewhat smaller; and three, the effects of U.S. food prices as measured by the CPI, the Consumer Price Index, which tend to be smaller still due to the relatively small value accounted for commodities in the total consumer food bill.

In my written testimony, I have described the factors affecting the farm commodity prices and the effects of biofuel production on commodity prices, global food prices, and retail food prices in the United States.

While increased biofuels production in the United States is partially responsible for the increase in corn and soybean farm prices, other factors have also contributed to the sharp increase in prices for these commodities. We use various analytical approaches to estimate the effects of increased ethanol and biodiesel production on corn and soybean markets for the 2006 and 2007 marketing years. We estimate that about 30 percent of the increase in the price of corn between marketing years 2005 and 2007 can be attributed to the growth in biofuels production in the U.S.

The growth in biofuels production in the United States has also pushed up soybean, soybean meal, and soybean oil prices. We esti-

mate the percentage increase in the prices of soybeans, soybean meal, and soybean oil between marketing years 2005 and 2007 would have been 25 to 40 percent lower in the absence of any growth in biofuels production in the U.S. Again, those were the price effects on the feedstock prices themselves.

Turning to the International Monetary Funds's Global Food Commodity Price Index, it is often quoted as an indicator of a change in global food prices. The IMF index includes a bundle of agricultural commodities, including cereals, such as wheat, corn, rice, and barley, as well as vegetable oils and protein meals, meat, sugar, seafood, bananas, and oranges. The effects of biofuels production in the U.S. on global prices for agricultural goods is estimated by combining the individual commodity price impacts with their relative weights in the IMF price index. Assuming no growth in biofuels production in the U.S., we estimate that the IMF Global Food Commodity Price Index would have been increased by over 40 percent compared with the actual increase of 45 percent from April 2007 to April 2008.

Let me turn briefly to the effects of higher feed prices on dairy, livestock, and poultry markets. In my testimony, I present a chart that looks at the ratio of livestock prices relative to feed costs. These livestock feed cost ratios are a measure of the pressure on livestock producers to adjust future production in response to higher feed costs.

In April, the steer and heifer corn price ratio was the lowest since August 1996. The hog corn price ratio was the lowest since December 1998, and the milk feed price ratio and the broiler feed price ratio were the lowest since at least 1995.

To estimate the effects of growth in ethanol on biofuels production on U.S. retail food prices, we have assumed that all of the increase in prices for corn, other feed grains, soybean oil, soybeans, and soybean meal are passed on to consumers through higher retail food prices. In 2007, the expansion in ethanol and biodiesel production is estimated to have increased the CPI for all food by 0.1 to 0.15 percentage points, or the expansion in ethanol and biodiesel production accounted for about 3 to 4 percent of the increase in retail food prices. During the first 4 months of 2008, the food CPI increased by 4.8 percent, with increased ethanol and biodiesel production accounting for about 4 to 5 percent of the increase in retail food prices.

Over time, livestock and dairy producers will adjust to higher feed costs by reducing production, leading to higher retail prices for animal products. In future years, production adjustment by livestock and dairy producers in response to higher feed costs resulting from the expansion in ethanol and biodiesel production could add a total of 0.6 to 0.7 percentage points to the CPI for all food.

Last, much attention is focused on the size of this year's corn crop. In March, producers indicated they would plant an estimated 86 million acres of corn, down from the 93.6 million acres planted in 2007. However, a wet spring in the Midwest has slowed plantings and crop emergence and, in some cases, washed out fields planted to corn.

USDA will report acreage in its acreage report on June 30 and its first objective yields survey for 2008 will be reported on August 12. Both of these reports will be watched very closely.

A shorter crop than expected could send corn prices sharply higher. Indeed, over the last week, we have seen quite a large rise in corn prices with the December 2008 corn futures contract closing at $7.33 per bushel yesterday. An increase of over $1 over the past few weeks—and this, indeed, puts pressure as we watch—looking forward, will put pressure on ethanol production margins.

Mr. Chairman, that completes my statement.

[The prepared statement of Mr. Glauber follows:]

PREPARED STATEMENT OF JOSEPH GLAUBER, CHIEF ECONOMIST, DEPARTMENT OF AGRICULTURE

Mr. Chairman, members of the Committee, thank you for the opportunity to discuss the effects of the expansion in biofuels production in the U.S. on commodity markets and food prices here and abroad. In the United States, two commodities, corn and soybean oil account for over 90 percent of biofuels production. From April 2007 through April 2008, corn and soybean prices rose by over 50 percent in response to a variety of factors, including domestic and global economic growth; global weather; rising input costs for energy; international export restrictions; and new product markets, particularly biofuels. Over the same period, global food commodity prices as measured by the International Monetary Fund (IMF) rose by over 45 percent and retail food prices in the U.S. increased by more than 5 percent. I will describe the factors affecting farm commodity prices and the effects of biofuels production on commodity prices, global food prices, and retail food prices in the United States.

KEY FACTORS BEHIND THE INCREASE IN COMMODITY PRICES

Many factors have converged to increase commodity prices. Global economic growth, weather problems in some major grain producing countries, and depreciation in the value of the dollar have increased the demand for U.S. agricultural commodities, leading to higher commodity prices. In FY 2008, the value of U.S. agricultural exports is projected to reach a record $108.5 billion, up from last year's record of $81.9 billion.

Global economic growth is boosting the demand and prices for agricultural commodities. Real foreign economic growth was a healthy 4.0 percent in 2007, only slightly below 2006's robust rate of 4.2 percent. Foreign economic growth is expected to be 3.9 percent in 2008, down slightly from 2007, but well above trend, as has been the case beginning in 2004 (Economic Research Service). Asia, excluding Japan, will likely grow at over 7 percent in 2008, above trend for the fifth consecutive year. Higher incomes are increasing the demand for processed foods and meat in rapidly growing developing countries, such as India and China. These shifts in diets are leading to major changes in international trade. For example, China's corn exports are projected to fall from 5.3 million metric tons in 2006/07 to 0.5 million metric tons in 2007/08, as more corn is used for domestic livestock feeding.

Adverse weather events in a number of countries have reduced production leading to higher commodity prices. The multi-year drought in Australia reduced wheat and milk production and that country's exportable supplies of those commodities. Drought and dry weather have also adversely affected grain production in Canada, Ukraine, the European Union, and the United States. These weather events have helped to deplete world grain stocks. With world stocks for wheat at a 30-year low, grain importers are increasingly turning to the U.S. for supplies. Furthermore, the tight stocks situation is leading to increasing concerns that prices could move sharply higher if this year's harvest falls below expectations. These concerns are causing some importers to purchase for future needs, pushing prices higher.

Many exporting countries have put in place export restrictions in an effort to reduce domestic food price inflation. The United Nations Food and Agriculture Organization recently noted the cereal import bill of the world's poorest countries is forecast to rise by 56 percent in 2007/2008, which comes after a significant increase of 37 percent in 2006/2007. Exporting countries as diverse as Argentina, China, India, Russia, Ukraine, Kazakhstan, and Vietnam have placed additional taxes or restrictions on exports of grains, rice, oilseeds, and other products. By reducing supplies available for world commerce, these actions exacerbate the surge in global com-

modity prices. Export restrictions are ultimately self-defeating, reducing the incentives for producers to increase production.

Higher food marketing, transportation, and processing costs are also contributing to the increase in retail food prices. Record prices for diesel fuel, gasoline, natural gas, and other forms of energy affect costs throughout the food production and marketing chain. Higher energy prices increase producers' expenditures for fertilizer and fuel, driving up farm production costs. Higher energy prices also increase food processing, marketing, and retailing costs. These higher costs, especially if maintained over a long period, tend to be passed on to consumers in the form of higher retail prices. ERS estimates direct energy and transportation costs account for 7.5 percent of the overall average retail food dollar. This suggests that for every 10 percent increase in energy costs, the retail food prices could increase by as much as 0.75 percent if fully passed on to consumers.

RECENT DEVELOPMENTS IN COMMODITY MARKETS

Higher commodity prices are contributing to the increase in food price inflation, even though in the United States the farm value accounts for only about 20 cents of each dollar spent on food. For highly processed foods, such as cereal and bakery products, the farm component of the retail value is less as processing costs account for a higher portion of the retail value. In contrast, for food products that undergo little processing prior to being consumed, such as eggs and fresh fruits and vegetables, the farm value accounts for a much larger share of the retail value.

The index of prices received by farmers for all products increased by 18 percent in 2007, as farm prices for several major crops, beef, milk, broilers, and eggs either reached new record highs or posted large annual gains. Compared to one year ago, the index of prices received by farmers for all products was up 13 percent during the first 4 months of 2008. Over the same period, the prices received for all crops were up 19 percent, reflecting continued strong prices for major crops. Meanwhile, the prices received for livestock and livestock products, while up 7 percent during the first 4 months of 2008 compared to one year ago, have moderated in recent months as record large supplies of red meat and poultry have lowered farm prices for cattle and hogs.

Wheat & Coarse Grains: The 2007/08 wheat marketing year reflects a third straight year in which global production has fallen short of consumption, driving expected world stocks to their lowest level in 30 years. Back-to-back years of lower production in the major exporting countries, including Australia, Canada, and the European Union, have combined with below-trend yields in the United States to reduce the availability of exportable supplies. Tight supplies in competitor countries and restrictions on exports in major producing countries such as Argentina, Ukraine, and Russia have boosted export demand for U.S. wheat. U.S. ending stocks are projected at their lowest level in 60 years. As a consequence, wheat prices have increased to record levels. Farm prices for 2007/08 are estimated at a record $6.50 per bushel, sharply higher than last year's $4.26 and the previous record of $4.55 per bushel.

Wheat producers indicated in March they intend to plant 63.8 million acres in 2008, up 6 percent from 2007. Yield prospects for the 2008 crop remain mostly favorable, but persistent dryness remains a concern in the southwestern portions of the hard red winter wheat belt in western Kansas and the panhandle areas of Texas and Oklahoma. In addition to higher production in the U.S., wheat production in other major wheat producing countries is expected to rise sharply as planted area is up around the world, spurred by record prices and encouraged by favorable fall sowing weather. If trend yields are achieved, world production could set a new record, rising as much as 50 million tons from 2007/08. Global production is expected to exceed global consumption for the first time in four years leading to some recovery in global wheat stocks. Nonetheless, the average farm price is projected to increase in 2008/09 to $6.75-$8.25 per bushel, supported by forward sales made at prices well above last year's level. Cash wheat prices during the first quarter of the marketing year are also expected to be supported by strong competition between domestic mills and foreign buyers.

The U.S. corn market in 2007/08 is characterized by record production and farm prices driven by strong domestic and export demand, which is boosting use to record levels. U.S. producers planted 93.6 million acres to corn in 2007, the largest plantings since 1944. Domestic use for 2007/08 is estimated at a record 10.5 billion bushels, up 1.4 billion or 16 percent from last year. Ethanol use, projected at 3.0 billion bushels, is expected to surpass exports for the first time ever, accounting for 23 percent of total corn use. Despite high prices, export demand remains strong with growing world demand for animal protein and tight supplies of feed quality wheat, par-

ticularly in the European Union. Exports are projected at a record 2.45 billion bushels, up 15 percent from last year. The farm-level price of corn for 2007/08 is expected to average a record $4.25-$4.45 per bushel, up substantially from $3.04 per bushel in 2006/07.

Corn prices are expected to rise again in 2008/09. Demand is expected to remain strong, supported by expanding use for ethanol, which is forecast to reach 4 billion bushels in 2008/09. Corn area and production are expected to be lower in 2008/09 as record soybean prices and high input costs for corn encourage a rebound in soybean plantings. Producers indicated in March they intend to plant 86.0 million acres of corn in 2008, down 8 percent from last year. In addition, cool, wet weather slowed planting progress, which could also lead to lower corn plantings and lower yields in 2008. With higher use and lower production, ending stocks are expected to decline, keeping upward pressure on prices. The farm price of corn is forecast to average $5.30-$6.30 per bushel in 2008/09.

Rice: Tighter domestic rice supplies, higher global rice prices, and export bans imposed by some major rice exporters have helped to boost U.S. rice prices in 2007/08. Producers cut back on rice area in 2007 by 3 percent, because they could earn higher returns by planting alternative crops such as wheat, corn, sorghum and soybeans. U.S. exports in 2007/08 are projected to increase 23 percent to 112 million hundredweight (cwt). Tight global supplies and self-imposed export bans in Egypt, Vietnam, and India are helping to support U.S. exports. Rice ending stocks are forecast at 21.6 million cwt, down from carry-in stocks of 39 million cwt. The season-average farm price is forecast at $12.85-$13.15 per cwt, up from $9.96 in 2006/07 and the highest since 1973/74. Domestic rice prices in 2008/09 are expected to be higher than in 2007/08 due to tighter domestic and global supplies and higher world prices.

Soybeans: U.S. soybean prices are record high this year, reflecting lower production and strong demand. The farm price received for soybeans is estimated to average $10.00 per bushel during 2007/08, compared with $6.43 last marketing year and the previous record of $8.73 per bushel set in 1983/84. Lower production was brought about by sharply lower planted area as producers shifted some soybean acres to corn in 2007. Lower stocks are projected in part due to strong export demand for U.S. soybeans resulting from record imports by China and limited growth in South American supplies despite high prices.

U.S. soybean crush is also a contributing factor to declining stocks as foreign demand for U.S. soybean meal remains exceptionally strong. Wheat shortages in many parts of the world are leading to strong export demand for soybean meal protein which can be used to replace wheat in feed rations. Soybean crush is also supported by growing demand for biodiesel, production of which is expected to account for 14 percent of total soybean oil use for 2007/08. Strong domestic and export demand have pushed prices for both soybean meal and soybean oil higher. The prices of both soybean meal and soybean oil are up by over 50 percent in 2007/08, compared with one year ago.

U.S. producers indicated in March they intend to plant 74.8 million acres to soybeans in 2008, up 18 percent from last year. If these intentions are realized, soybean supplies for 2008/09 could increase as larger production more than offsets sharply lower beginning stocks. Reflecting the increase in projected soybean production, soybean ending stocks are expected to rebound in 2008/09 from this year's very low level. Forward sales at prices above last year's average and high corn prices are likely to push soybean prices higher in 2008/09. The farm price of soybeans is currently forecast to average $11.00-$12.50 per bushel in 2008/09.

Fruits and Vegetables: Retail prices for fruits and vegetables increased 3.8 percent in 2007, as fresh fruit and vegetable prices rose by 3.9 percent and processed fruit and vegetable prices rose by 3.6 percent. Price spikes in these commodities are often linked to drought or freeze damage. In 2008, the CPI for fruits and vegetables is projected to increase by 3.5-4.5 percent.

Livestock and Poultry: Beef production is currently forecast to increase by 1.5 percent in 2008 due to continued strong cow slaughter. Drought conditions in the Southeast led to strong increases in cow slaughter last year and, even with a return to normal weather in 2008, cow slaughter is expected to remain relatively high in 2008. The January Cattle report indicated the cow herd continued to contract during 2007. Beef cow numbers were estimated about 0.6 percent lower than a year ago, and the number of beef cows expected to calve was down 1 percent. In addition, the number of beef heifers to be retained for the breeding herd was down 3.5 percent. Higher feed costs are lowering returns to cattle feeders. Nebraska Direct steer prices averaged a record $91.82 per cwt in 2007 and are expected to average $89-$93 per cwt. in 2008.

Pork production in 2008 is expected to increase 6.6 percent due to expansion triggered by positive returns to producers in 2006 and 2007 and strong productivity gains. However, the growth in production is expected to slow later in the year as producers respond to much higher feed costs. The most recent Quarterly Hogs and Pigs report indicated that producers farrowed 5 percent more sows during December 2007-February 2008, but intend to farrow 2 percent fewer sows during June 2008-August 2008. In 2008, hog prices are expected to decline from 2007's $47.09 per cwt to $46-$48 per cwt.

Broiler producers reacted to low returns in 2006 and pulled back broiler production during the last two quarters of 2006 and the first two quarters of 2007. As broiler prices hit record levels in mid-2007, broiler producers responded by expanding production. Since last fall, weekly estimates of chicks placed for growout were consistently 3 to 5 percent above a year earlier, but the increase in placements has dropped below 3 percent recently. However, little to no expansion in broiler production is expected during the second half of 2008, as producers respond to higher corn and soybean meal prices. Broiler prices for 2008 are forecast to average 80 to 83 cents per pound in 2008, compared with a record 76.4 cents in 2007.

Eggs: In 2007, the wholesale price for a dozen grade A large eggs in the New York market averaged $1.14 per dozen, 43 cents higher than the previous year. The strong increase in egg prices reflected lower production and strong domestic demand. In 2007, table-egg production was down 1 percent, as producers lowered production in order to increase the hatching-egg flock.

Given the current size of the table-egg flock and the number of birds available to add to the flock, no significant expansion in production is expected in 2008. Wholesale table-egg prices (New York area) averaged $1.59 per dozen in the first-quarter, up 51 percent from the previous year. Prices are expected to decline seasonally in the second quarter and average $1.21-$1.25 per dozen in 2008.

Milk: Very strong international dairy product prices, robust domestic demand and modest expansion in domestic production in response to very low milk prices in 2006 were the primary factors pushing up dairy product prices in 2007. The recent increase in feed costs probably had only a minimal effect on milk production in 2007.

Although higher feed costs are expected to temper later-year expansion plans, milk producers are expanding herds in response to generally favorable returns during much of 2007. Production in 2007 increased about 2 percent as the herd increased fractionally. Milk per cow increased but lagged its historical growth. Driven by strong domestic demand and sharply higher international prices in response to declining milk production in Australia due to drought and limited surpluses of dairy products in the European Union, the all-milk price averaged a record $19.13 per cwt, over $6.00 above 2006. Cow numbers are expected to increase further in 2008 but high feed costs may slow the growth in milk per cow. Milk production in 2008 is expected to increase about 2 percent and about equal the growth in demand for dairy products domestically and for export. The all-milk price is forecast to average $18.90-$19.30 per cwt in 2008.

EFFECTS OF BIOFUELS PRODUCTION ON COMMODITY PRICES

In recent years, the conversion of corn and soybean oil into biofuels in the United States has been an important factor shaping major crop markets. The amount of corn converted into ethanol and soybean oil converted into biodiesel nearly doubled from 2005/06 to 2007/08. The growth in biofuels production has coincided with rising prices for corn, soybeans, soybean meal, and soybean oil.

While increased biofuels production in the United States is partially responsible for the increase in domestic corn and soybean farm prices, other factors have also contributed to the sharp increase in prices for these commodities. The strength in exports resulting from global economic growth and drought and dry weather in some major grain producing countries has boosted prices for corn and soybeans. For example, corn exports are projected to reach 2.45 billion bushels in 2007/08, up from 2.1 billion bushels in 2005/06, and soybean exports are projected to increase by 18 percent over the same period.

Estimating the effects of increased ethanol and biodiesel production on domestic agriculture and domestic food prices necessitates segmenting the portion of the increase in corn and soybean prices due to the expansion in ethanol and biodiesel production and the increase in corn and soybean prices due to other factors. Various analytical approaches were used to estimate the effects of increased ethanol and biodiesel production on corn and soybean prices. Table 1 compares actual and estimated corn and soybean prices over the period 2005/06-2007/08, assuming corn used for ethanol and soybean oil used for biodiesel production in the United States remained unchanged from the amount used in the 2005/06 marketing year.

Table 1. Estimated Effects of Increased Ethanol and Biodiesel Production on Corn and Soybean Prices

	2005/06	2006/07	2007/08
Corn Price ($/Bu.)			
Actual	2.00	3.04	4.25
Alternative 1/		2.80	3.60
Soybean Price ($/Bu.)			
Actual	5.66	6.43	10.00
Alternative 1/		6.25	8.25
Soybean Oil Price (cents/lb.)			
Actual	23.41	31.02	52.00
Alternative 1/		30.35	45.25
Soybean Meal Price ($/ton)			
Actual	174	205	315
Alternative 1/		201	274

1/Assumes the amount of corn used for ethanol and soybean oil used for biodiesel production in the United States remained unchanged from the amount used in the 2005/06 marketing year. This scenario was selected to depict the effects of increased ethanol and biodiesel production on corn and soybean prices and does not represent a specific policy scenario.

Under the alternative scenario, lower corn and soybean oil use lowers the prices of corn and soybeans. In addition, changes in relative returns for corn and soybeans cause producers to switch from planting corn to planting soybeans. Lower corn and soybean prices could also result in increased plantings and lower prices for other crops and lower feed costs to livestock producers.

The recent increase in corn and soybean prices appears to have little to do with the run-up in prices of wheat and rice. Corn and soybean prices began increasing during the fourth quarter of 2006. By this time, producers had already planted the 2007 winter wheat crop. Rice and spring wheat plantings could have been affected by increasing corn and soybean prices, but weather problems, low stocks, and strong global demand likely had a much greater impact on wheat and rice prices than increasing corn and soybean prices in 2007/08. In 2008, U.S. wheat producers indicate they intend to plant more acreage to wheat, while rice acreage is projected to remain flat, suggesting that higher corn and soybean prices have not greatly altered wheat and rice producers' planting decisions.

EFFECTS OF BIOFUELS PRODUCTION ON GLOBAL FOOD COMMODITY PRICES

The International Monetary Fund's (IMF) global food commodity price index is often quoted as an indicator of the change in global food prices. The IMF global food commodity price index includes a bundle of agricultural commodities including cereals such as wheat, corn (maize), rice, and barley as well as vegetable oils and protein meals, meat, seafood, sugar, bananas, and oranges. A complete list of the commodities included in the index, the percentage change in each commodity price, and the estimated contribution of each commodity to the overall percentage change in the food price index from April 2007 to April 2008 are presented in Table 2. It is unclear how the list of commodities and the prices used in the IMF index relate to the foods purchased and the prices paid for food items by consumers in less developed countries.

The IMF global food price commodity price index increased by an estimated 45.0 percent from April 2007 to April 2008. Sunflower oil and rice exhibited the largest price changes, with prices for both commodities increasing by over 200 percent. Prices for corn, wheat, soybeans, soybean oil, soybean meal, palm oil, sunflower oil, and rapeseed oil also exhibited relatively large price increases,while the prices for beef and swine meat actually fell.

Combining the change in corn prices with the corn weight of 8.1 percent, the change in corn prices contributed 5.0 percentage points to the estimated 45.6 percent increase in the global food commodity price index. Soybeans, soybean oil, and soybean meal exhibited larger price increases and play a much larger role in the

global food commodity price index, a combined weight of over 15 percent. The combined effects of the increase in soybean, soybean meal, and soybean oil prices contributed 11.7 percentage points to the estimated 45.0 percent increase in the IMF global food commodity price index from April 2007 to April 2008.

Table 2. Contribution to the IMF Food Commodity Price Index, April 2007 to April 2008. 1/

Food Commodity	Weight	April 2007 to April 2008	Contribution to Overall Change
		Percentage Change	Percentage Points
Food	100	45.0	45.0
Cereals			
Wheat	10.9	82.7	9.0
Corn (Maize)	8.1	61.7	5.0
Rice	3.6	215.0	7.7
Barley	2.2	51.0	1.1
Vegetable oils and Protein Meals			
Soybeans	7.5	78.6	5.9
Soybean Meal	4.6	69.3	3.2
Soybean Oil	3.2	80.9	2.6
Palm Oil	6.2	67.9	4.2
Sunflower Oil	0.5	223.5	1.2
Olive Oil	1.3	-4.8	-0.1
Fish Meal	1.6	-8.1	-0.1
Groundnuts	1.5	66.6	1.0
Rapeseed Oil	2.0	87.1	1.7
Meat			
Beef	7.2	-11.8	-0.9
Lamb	1.3	16.9	0.2
Swine Meat	5.6	-6.5	-0.4
Poultry	4.7	5.0	0.2
Seafood			
Fish	15.2	7.2	1.1
Shrimp	3.7	-23.0	-0.8
Sugar			
Free Market	2.8	30.5	0.9
United States	0.2	-1.8	0.0
EU	1.2	-0.4	0.0
Bananas	2.3	49.9	1.2
Oranges	2.5	42.7	1.1

1/Estimated from the International Monetary Fund (IMF) 8 price indices and 49 actual price series. The prices are available from the IMF web site at http://www.imf.org/

In order to estimate the impact of the increased production of U.S. biofuels on global food prices, one needs to estimate the direct and indirect effects of the increased use of corn and soybeans on individual commodity prices. Last month, CEA testified before the Senate Foreign Relations Committee about corn-based ethanol's impact on global food prices using this strategy. The analysis below continues in this spirit, but it considers a broader category of factors and costs and a slightly different time period. Here the analysis is updated to the 12 months ending in April, and the analysis considers a broader mix of biofuels—focusing on corn-based and soybean oil-based biofuels.

Table 3 presents the estimated effects of increased ethanol and biodiesel production in the United States on global prices for corn, soybeans, soybean oil, and soybean meal as well as the impact on the IMF global food commodity price index. We estimate that the percentage increase in the price of corn from April 2007 to April 2008 would have been 23 percent lower in the absence of any growth in biofuel pro-

duction in the United States. Based on this analysis, we estimate that the price of corn would have increased by 47.5 percent assuming no growth in biofuel production in the United States, down from the actual increase of 61.7 percent, from April 2007 to April 2008. Assuming no growth in biofuel production, the price of soybeans, soybean meal, and soybean oil in the global food commodity price index would have increased by 54.2, 51.2, and 61.5 percent, respectively, down from actual increases of 78.6, 69.3, and 80.9 percent, respectively, from April 2007 to April 2008.

Table 3. Effects of biofuel production in the United States on global food commodity prices.

	With Biofuels	Without Biofuels
	Percentage Change	Percentage Change
Food	45.0	40.6
Corn (Maize)	61.7	47.5
Soybeans	78.6	54.2
Soybean Meal	69.3	51.2
Soybean Oil	80.9	61.5

Assuming no growth in biofuel production in the United States, the IMF global food commodity price index would have increased by 40.6 percent compared to the actual increase of 45 percent, from April 2007 to April 2008. Lower corn prices contributed 1.2 percentage points, lower soybean, soybean meal, and soybean oil prices contributed 3.2 percentage points to the total reduction in the global food commodity price index.

However, combining soybeans, soybean meal, and soybean oil in the same index overstates the impact of biofuels on global prices. Soybeans are processed into soybean meal and oil and by including the effects of biofuels on the prices of all three commodities we magnify the impacts of biofuels on the global food prices. If we exclude the impacts of biofuels on soybean meal and oil prices, the IMF global food price index would have increased by 42.0 percent assuming no growth in biofuels production in the United States, compared to the actual increase of 45.0 percent from April 2007 to April 2008.

EFFECTS OF BIOFUELS PRODUCTION ON U.S. RETAIL FOOD PRICES

In 2007, the Consumer Price Index (CPI) for all food increased by 4.0 percent, up from 2.4 percent in both 2004 and 2005. In 2007, the retail price of eggs increased by 29.2 percent, retail dairy product prices rose by 7.4 percent, retail poultry prices posted a 5.2 percent gain, and retail beef prices increased by 4.4 percent. In 2008, the CPI for all food is projected to increase by 4.5 to 5.5 percent, with the retail prices of eggs, dairy products, fats and oils, and cereals and bakery products all increasing by more than 5 percent.

It is very unlikely that the retail prices for dairy products, beef, poultry, and eggs were greatly affected by higher corn and soybean prices in 2007. Higher corn and soybean prices increase livestock and dairy producers' feed costs. The increase in feed costs, with no offsetting increase in livestock prices, reduces livestock producers' margins. Livestock producers react to these lower margins over time by reducing the breeding herd. In the short term, higher feed costs lead to an increase in livestock slaughter and lower livestock prices. For milk and eggs, higher feed costs may have lowered production somewhat 2007, partially contributing to the increase in retail prices for these food products. However, other factors, such as low returns in 2006, strong demand, abnormally high international prices, especially for dairy products, and increasing use of eggs for hatching to expand broiler production likely contributed to the bulk of the increase in retail food prices for these commodities in 2007.

The ratio of livestock prices relative to feed costs is a measure of the pressure on livestock producers to adjust future production in response to higher feed costs. In April, the steer and heifer corn price ratio (bushels of corn equal in value to 100 pounds of steers and heifers, live weight) was the lowest since August 1996, the hog-corn price ratio (bushels of corn equal in value to 100 pounds of hog, live weight) was the lowest since December 1998, and the milk-feed price ratio (pounds of 16 percent mixed dairy feed equal in value to 1 pound of milk) and the broiler-feed price ratio (pounds of broiler grower feed equal in value to 1 pound of broiler, live weight) was the lowest since at least 1995.

In 2008, higher feed costs are likely to lead to lower prices for beef and pork as producers react to higher feed costs by reducing the number of breeding animals.

In contrast, dairy producers react to higher feed costs by cutting back on the number of dairy cows and adjusting rations. In 2008, higher feed costs are expected to dampen the growth in milk production per cow but the dairy herd is expected to continue to expand in response to strong milk returns in 2007.

To estimate the effects of growth in ethanol and biodiesel production on U.S. retail food prices, we assume that all of the increase in prices for corn, other feed grains, soybeans, soybean oil and soybean meal presented in Table 1 are passed on to consumers through higher retail food prices. In 2007, the expansion in ethanol and biodiesel production is estimated to have increased the CPI for all food by 0.10-0.15 percentage point. During the first four months of 2008, the all food CPI increased by 4.8 percent, with increased ethanol and biodiesel production in the U.S. accounting for about 0.20-0.25 percentage point of the increase in retail food prices. Over time, livestock and dairy producers will adjust to higher feed costs by reducing production leading to higher retail prices for animal products. In future years, production adjustments by livestock and dairy producers in response to higher feed costs resulting from the expansion in ethanol and biodiesel production could add a total of 0.6-0.7 percentage point to the CPI for all food.

CONCLUSION

Many factors have converged to increase corn and soybean prices. Some of these factors include domestic and global economic growth; global weather; rising input costs for energy; international export restrictions; and new product markets, particularly biofuels. At this time, the expansion in biofuel production in the United States would appear to be a relatively modest contributor to food price inflation globally and in the United States. Assuming no expansion in biofuel production in the U.S., we estimate the IMF global food commodity price index would have increased by over 40 percent from April 2007 to April 2008, compared with the actual increase of 45 percent. In the U.S., the CPI for all food would have increased by 4.55- 4.60 percent during the first four months of 2008, compared with the actual increase of 4.8 percent, assuming no expansion in U.S. biofuel production. In future years, production adjustments by livestock and dairy producers in response to higher feed costs resulting from the expansion in ethanol and biodiesel production could add a total of 0.6-0.7 percentage point to the CPI for all food.

Mr. Chairman, that completes my statement.

The CHAIRMAN. Thank you very much.

Dr. Outlaw.

STATEMENT OF JOE L. OUTLAW, AGRICULTURAL AND FOOD POLICY CENTER, TEXAS A&M UNIVERSITY, COLLEGE STATION, TX

Mr. OUTLAW. Mr. Chairman and members of the committee, thank you for the opportunity to testify on behalf of the Agricultural and Food Policy Center at Texas A&M University. For more than 25 years, we have worked with the agricultural committees in the U.S. Senate and House of Representatives providing members and committee staff objective research regarding the potential effects of agricultural policy changes.

My testimony today summarizes the results of a number of our reports and analyses that evaluate the potential impacts of changes to U.S. renewable fuels policies. The most recent study, which I have provided for the record, analyzed the impacts of farm level corn prices on the retail prices of selected food products at the national level and also included analysis of alternative RFS levels.

In the short run, it can be argued that economic encouragement is needed to develop a new industry through Government policies. However, in the long run, the cost of production will determine whether biofuels are a viable energy alternative. The answer as to whether the corn-based ethanol industry will be viable over the long run is: it depends.

Table 1 illustrates that the net returns for a typical ethanol plant varies substantially depending on the feedstock costs and the ethanol price. Currently the corn price in the U.S. is around $6 per bushel and the ethanol price is slightly under $2.50 per gallon. With this combination, a typical ethanol plant would be expected to realize 6 cents per gallon in net income. While positive, these profit levels are not as likely to spur additional investment. Clearly, this is the reason why some proposed ethanol plants have put their plans on hold. However, for those plants already built, it is in their best interest to continue to produce as long as they can cover the variable costs increasing the amount a plant would actually pay for corn.

Recent requests for a waiver to the RFS inspired research looking at whether a waiver, if granted, would have a significant impact. The initial RFS, instituted under the energy bill of 2005, always had a limited probability of binding, given that the powerful market incentives for ethanol production that prevailed in the 2 years following its establishment. The new RFS, instituted under the 2007 energy bill, requires significantly higher levels of blending.

We analyzed the possible market outcomes under the RFS and under partial waivers of one-quarter and one-half of the conventional biofuel RFS. The waivers are assumed to be immediate and permanent.

As indicated in table 2, the expected national average wholesale market prices for ethanol are likely to remain in the mid-$2 per gallon range, with expected prices being somewhat lower if the RFS is relaxed by one-quarter and even lower still if the RFS is relaxed by one-half. Under all scenarios, these expected levels of ethanol production are above the RFS by a billion gallons or more, except for 2008 when the margin is much smaller. This again reflects the fact that high fossil energy prices will result in high demand for ethanol as a fuel extender. Partial relaxation of the conventional biofuel RFS would result in somewhat lower expected levels of production.

Like ethanol prices, expected corn prices are fairly steady near current levels under all scenarios. Expected prices across scenarios gradually diverge, with the one-quarter RFS waiver price falling about 30 cents per bushel below the full RFS price and the one-half RFS waiver price falling about 50 to 60 cents per bushel lower.

To summarize the results, a sustained reduction in RFS by one-quarter to one-half of the RFS would not significantly reduce ethanol production or prices. These policy changes would be expected to result in corn prices that are 5 to 10 percent lower than under current policies.

At the bottom of page 3, I would like to note a typo. It says 7 billion acres of corn. It should be "million." If it was 7 billion, we would not be here today.

[Laughter.]

Mr. OUTLAW. In an attempt to quantify the impact of key economic variables on selected retail food prices, we examined the dynamic interrelationships among retail food prices and the prices of labor, crude oil, and corn. Using data from January 1990 to February 2008, the results indicate that higher corn prices can be

passed through to consumers relatively quickly for bread, in this case, through acreage competition with wheat acres, milk, and eggs, with retail prices of those products rising by amount commensurate with the quantities of grains used in their production.

We also find, however, that the contribution of higher corn prices to recent increases in the retail prices of bread, milk, and eggs are smaller than the contributions of other factors such as national and international weather variability and production cycles.

Labor cost increases have also contributed to increased retail prices of these commodities, but the effects of increased energy prices have been minimal through February 2008.

By contrast, we detected no statistically significant effect of corn on retail meat prices to date. Taken as a whole, this evidence suggests that over the short term livestock producers have been unable to pass higher feed costs to consumers due to their industry structure and competitive pressures. There is no doubt, however, that these industries are experiencing dramatic financial losses due to increases in their cost of production. If current market conditions persist, meat supplies will eventually decline due to producer attrition and capacity reduction, which will lead to higher retail prices for meats. In short, retail meat prices must eventually adjust to reflect increased feed costs. The only uncertainty is the timing and the duration of adjustment.

Mr. Chairman, that completes my statement.

[The prepared statement of Mr. Outlaw follows:]

PREPARED STATEMENT OF JOE L. OUTLAW, AGRICULTURAL AND FOOD POLICY CENTER, TEXAS A&M UNIVERSITY, COLLEGE STATION, TX

Mr. Chairman and members of the Committee, thank you for the opportunity to testify on behalf of the Agricultural and Food Policy Center at Texas A&M University on our research regarding the relationship between U.S. renewable fuels policy and food prices. For more than 25 years we have worked with the Agricultural Committees in the U.S. Senate and House of Representatives providing Members and committee staff objective research regarding the potential affects of agricultural policy changes.

Due to the growing interdependence of agriculture and energy, over the past 5 years our Center has been focusing a considerable amount of research toward renewable energy policy and the likely consequences for U.S. agricultural producers, consumers, and renewable energy industry participants.

My testimony today summarizes the results from a number of our reports and analyses that evaluate the potential impacts of changes to U.S. renewable fuels policies. The most recent study, which I have provided for the record, is entitled "The Effects of Ethanol on Texas Food and Feed".* This report included an analysis of the impacts of farm level corn prices on the retail prices of selected food products at the national level and alternative RFS levels.

Over the past few years, the U.S. ethanol industry has been expanding as fast as plants could feasibly be built. Currently, as corn prices have increased, some of the proposed ethanol plants have dropped their plans and/or put them on hold. Most industry observers realize the Renewable Fuels Standard (RFS) contained in the Energy Policy Act of 2005 was never binding. However, this may not be the case with the RFS of 15 billion gallons of grain based ethanol mandated in the Energy Independence and Security Act of 2007. Depending on corn and ethanol prices, the higher mandate will likely encourage the expansion of ethanol capacity to, at least, the 15 billion gallon per year level.

Governments around the world have enacted policies designed to encourage biofuels production, use, and protect biofuel producers from international competition. The U.S. has chosen to utilize a combination of the three: 1) the volumetric ethanol excise tax credit that is generally referred to as the "blender's credit", 2) the ethanol import tariff, and 3) the renewable fuels standard (RFS). There is no

*Report has been retained in committee files.

question that these three policy tools have influenced the amount of ethanol produced and consumed in the United States, as well as the level of ethanol imports.

In the short-run, it can be argued that economic encouragement is needed to develop a new industry through government policies. However, in the long run, the cost of production will determine whether biofuels are a viable energy alternative. The answer as to whether the corn based ethanol industry will be viable over the long-run is—it depends. The price of oil and the cost of ethanol feedstocks, both more than double where they were only last year, will determine ethanol viability. With or without government support, there will likely be combinations of low and high oil prices and feedstock costs that result in profits or losses for the ethanol sector.

Table 1 illustrates that the net returns for a typical ethanol plant varies substantially depending on feedstock (corn) costs and the ethanol price. Currently, the corn price in the U.S. is around $6.00 per bushel, and the ethanol price is slightly under $2.50 per gallon. With this combination, a typical ethanol plant would be expected to realize $0.06 per gallon in net income. While positive, these profit levels are not as likely to spur additional investment. Clearly, this is the reason why some proposed ethanol plants have put their plans on hold. However, for those plants already built, it is in their best interest to continue to produce as long as they can cover their variable costs increasing the amount a plant could pay for corn. There are a large number of ethanol and corn price combinations that result in negative net returns for a plant. While these numbers are typical of a 100 million gallon per year plant, each plant location has attributes or drawbacks that could tilt (both positively and negatively) the economic picture for that plant location.

Recent requests for a waiver to the RFS inspired research looking at whether a waiver, if granted, would have a significant impact. The initial RFS, instituted under the energy bill of 2005, always had a limited probability of binding or needing to insure the mandated level of ethanol blending given the powerful market incentives for ethanol production that prevailed in the two years following its establishment. The new RFS, instituted under the 2007 energy bill, requires significantly higher levels of blending.

We analyzed the possible market outcomes under the RFS, and under partial waivers of one-quarter and one-half of the conventional biofuel RFS. The waivers are assumed to be immediate and permanent. The results presented below reflect the averages for selected market variables over 500 realizations of possible future states of the world. In all scenarios, the tax credits for ethanol and biodiesel blending are assumed to continue. The high levels of fossil energy prices expected over the next few years result in powerful market incentives for ethanol production, in the absence of a supply-related spike in corn prices.

As indicated in Table 2, the expected national average wholesale market prices for ethanol are likely to remain in the mid-$2.00 per gallon range, with expected prices being somewhat lower if the RFS is relaxed by one-quarter, and even lower still if the RFS is relaxed by one-half. Under all scenarios these expected levels of ethanol production are above the RFS by a billion gallons or more, except for 2008 when the margin is much smaller. This again reflects the fact that high fossil energy prices will result in high demand for ethanol as a fuel extender. Partial relaxation of the conventional biofuel RFS would result in somewhat lower expected levels of production, as production would be lower if unfavorable market conditions were realized.

Like ethanol prices, expected corn prices are fairly steady near current levels under all scenarios. Expected prices across scenarios gradually diverge, with the one-quarter RFS waiver price falling about $0.30 per bushel below the full RFS price a few years out, and the one-half RFS waiver price falling about $0.50 to $0.60 per bushel below the full RFS expected price.

To summarize our results, a sustained reduction in the RFS by one-quarter to one-half of the RFS would not significantly reduce ethanol production or prices. These policy changes would be expected to result in corn prices that are 5 to 10 percent lower than those under current policies.

The boom in corn-based ethanol production in the United States has led to sharply higher corn prices and, by extension, higher soybean and other crop prices as farmers have shifted acres between crops. High prices for some crops like wheat and rice and other commodities such as milk have been higher are due to other causes. The ethanol, or biofuel, revolution has, in turn, been caused by rapidly increasing oil prices, aided by government policies and the desire for cleaner burning fuels to ease global warming fears. The overall effect on agriculture and the economy, as a whole, is complex. While corn prices have increased, crop producers also face higher fertilizer and fuel prices. Higher feed costs have caused large increases in produc-

tion costs for livestock producers. These rising production costs are being felt by producers, and to a lesser extent, consumers throughout the economy.

In our opinion the current discussion in the media about ethanol causing high food prices is overly simplistic. There is no doubt that higher corn prices are being transferred throughout the rest of the economy just as higher petroleum prices are impacting the economy. In the United States unlike most of the countries in the world, consumers spend a relatively small amount of their incomes on food—around 11 percent. The farmer's share of retail food prices is around $0.19 per dollar spent on food. Obviously for some products the share is higher—especially retail food products such as fresh vegetables that have not undergone significant transformation and further processing. That is not the case for corn in the United States. Corn is typically used as feed in livestock and poultry production or it generally undergoes significant processing before it ends up as one of many food ingredients such as HFCS in soft drinks.

Our report identifies a number of other factors that have also contributed to higher corn prices such as increased exports. The declining value of the dollar makes U.S. corn relatively cheaper to the rest of the world even with the highest corn prices on record. Another factor that has to be noted when discussing corn prices is the competition for land among commodities is another factor. Across the United States, not all land is suitable for producing every crop we grow. When farmers do have choices among crops, relative returns that consider relative prices and costs of production across crops cause crops with higher returns to bid land away from crops with lower returns. At planting time this year, the returns for soybeans relative to corn created an estimated 7 million acre shift from corn acres to soybean acres from 2007. This happened even though corn prices were relatively high by historical standards. Soybean prices were also high for a variety of reasons such as the increased demand for soybean oil in biodiesel production and higher export demand for soybeans as a food and feed protein.

And finally, the average person probably does not understand the degree to which the weather both in the U.S. and abroad impacts food prices. As indicated earlier, weather problems across the world contributed to lower wheat availability worldwide, leading to higher wheat prices that led to higher bread prices. U.S. retail prices of rice and milk have been impacted similarly.

In an attempt to quantify the impact of key economic variables on selected retail food prices, we examined the dynamic interrelationships among retail food prices and the prices of labor, crude oil, and corn. Using data from January 1990 to February 2008, the results indicate that higher corn prices can be passed through to consumers relatively quickly for: bread, milk, and eggs; with retail prices of those products rising by amounts commensurate with the quantities of grains used in their production. We also find, however, that the contribution of higher corn prices to recent increases in the retail prices of bread, milk, and eggs are smaller than the contributions of other factors, such as national and international weather variability and production cycles. Labor cost increases have also contributed to increased retail prices of these commodities, but the effects of increased energy prices have been minimal through February 2008.

By contrast, we detected no statistically significant effect of corn on retail meat prices, to date. Taken as a whole, this evidence suggests that over the short-term (less than two years), livestock producers have been unable to pass higher feed costs to consumers, due to their industry structure and competitive pressures. There is no doubt, however, that these industries are experiencing dramatic financial losses due to increases in their costs of production. If current market conditions persist, meat supplies will eventually decline due to producer attrition and capacity reduction, which will lead to higher retail prices for meats. In short, retail meat prices must eventually adjust to reflect increased feed costs, the only uncertainty is the timing and duration of the adjustment period.

Mr. Chairman, that completes my statement.

Table 1. Net Returns Per Gallon for a Typical 100 Million Gallon per Year Ethanol Plant at Various Ethanol and Corn Prices.

	Corn Price ($/bu, FOB Plant)						
Ethanol Price ($/gal)	**3.00**	**3.50**	**4.00**	**4.50**	**5.00**	**5.50**	**6.00**
1.50	(0.17)	(0.30)	(0.43)	(0.55)	(0.68)	(0.81)	(0.94)
1.75	0.08	(0.05)	(0.18)	(0.30)	(0.43)	(0.56)	(0.69)
2.00	0.33	0.20	0.07	(0.05)	(0.18)	(0.31)	(0.44)
2.25	0.58	0.45	0.32	0.20	0.07	(0.06)	(0.19)
2.50	0.83	0.70	0.57	0.45	0.32	0.19	0.06
2.75	1.08	0.95	0.82	0.70	0.57	0.44	0.31
3.00	1.33	1.20	1.07	0.95	0.82	0.69	0.56

Table 2. Estimated Effects of Alternative RFS Waiver Levels.

Corn Price ($/bu.)	**08/09**	**09/10**	**10/11**	**11/12**	**12/13**
No Waiver	4.90	4.57	5.00	4.95	5.28
Three-quarter RFS	4.88	4.47	4.80	4.74	4.99
Half RFS	4.88	4.43	4.72	4.61	4.82
Ethanol Price ($/gal.)	**2008**	**2009**	**2010**	**2011**	**2012**
No Waiver	2.45	2.46	2.38	2.41	2.43
Three-quarter RFS	2.45	2.44	2.34	2.35	2.36
Half RFS	2.45	2.44	2.33	2.33	2.33
Ethanol Production (billion gal.)	**2008**	**2009**	**2010**	**2011**	**2012**
No Waiver	9.3	12.1	13.9	15.3	16.7
Three-quarter RFS	9.3	12.0	13.4	14.6	15.7
Half RFS	9.3	11.9	13.3	14.2	15.2

The CHAIRMAN. Thank you very much.
Dr. Pyle, go ahead.

STATEMENT OF JASON PYLE, CHIEF EXECUTIVE OFFICER, SAPPHIRE ENERGY, INC., SAN DIEGO, CA

Mr. PYLE. Thank you. Mr. Chairman and members of the committee, thank you for inviting me to this important panel on this critical issue. I'm Jason Pyle, the Chief Executive Officer of Sapphire Energy.

First of all, I would like to thank you for your leadership on alternative and renewable fuels. Your vision for the Renewable Fuels Standard is guiding our country on the right path.

We are here to talk about a dilemma, though, and that is food versus fuel. I think the most important thing that I can say here is something that the committee already knows. If you empower innovators and entrepreneurs to solve this problem, then we can have a future where we do not have to choose between food and fuel.

Sapphire Energy has developed just such a technology, a technology that transcends the food versus fuel debate. Here it is. This is it right here. This is green crude, a truly renewable, truly sustainable alternative fuel product. It requires no food and no agricultural land. It is made entirely from algae in the desert. It is carbon-neutral. It can be produced at enormous scale, tens of billions of gallons a year. Best of all, just like petroleum, it can be used to make the products that we all use today, and when I say the products we all use today, I mean the gasoline, the diesel, and the aircraft fuel that are in our cars and our trucks and our fleets that are flying and driving right now.

This is not biodiesel and this is not ethanol. This is crude oil. It is green crude, a very real and very permanent solution to our energy needs.

Two weeks ago we announced that Sapphire Energy has produced the first renewable, ASTM-compliant, 91 octane gasoline from this crude. Using algae, we have turned sunlight into fuels, real fuels like the gasoline we all use, completely sustainable fuels that are carbon-neutral, highly scalable, use no food and no agricultural land.

Because of the support of visionaries like ARCH Venture Partners, Venrock Associates, and the Wellcome Trust, we will be putting this completely sustainable and carbon-neutral crude in the pipelines within 5 years' time.

But guess what. According to the current Renewable Fuels Standard, it is unclear if this will qualify as a renewable. It is kind of hard to believe.

Americans want energy independence and cleaner fuel products, not a specific subsidy for a specific fuel process. When this committee put forth the Renewable Fuels Standard, it was technology-neutral. You recognized that this country was built on innovation and ingenuity. You recognized that beyond biodiesel and beyond ethanol, we needed to encourage a new generation of sustainable products by allowing a fairer playing field for all renewable fuels. What we have is an RFS that supports technologies which rely mainly on food and agricultural land. What we need is a policy that supports all avenues to energy independence.

The food versus fuel debate is just the first of many that the technology-specific nature of the RFS will create. By subsidizing only a limited subset of technologies, we run the risk of discouraging a real future for America.

There have been discussions about repealing the Renewable Fuels Standard. I think this would be a terrible mistake. This would be a stumble backward in our Nation's quest for a cleaner and more secure energy future.

Ethanol and biodiesel will both be parts of a very valuable and renewable fuel mix, but they are not enough. The promise of cellulosic technologies are not enough. If we are going to produce 32

billion gallons of renewable fuel in 2022 and not ruin food and agricultural markets in the process, we are going to need every possible source of technology and ingenuity available. We are going to need all the forms of the technology to participate in the Renewable Fuels Standard. This committee understood that when the RFS was first proposed, and now I am asking you to return to that principle.

In conclusion, the phrase "food versus fuel" suggests a conflict, but we have just been forced into this dilemma because there have been virtually no alternatives to current fossil fuel usage. But now we have one. Green crude is here and I am telling you about it and it is something that I believe in. A renewable and sustainable source of gasoline and diesel and aircraft fuel. It does not use any agricultural land or food products. It is completely carbon-neutral.

Sapphire Energy can help you give the American people what they want: a cleaner and more secure energy future. Please help me and other innovative companies in this country to provide for the evolving Renewable Fuels Standard by creating a fair playing field for all of the products out there. If you take the handcuffs of technical progress, we can solve this food versus fuel debate and we can solve our energy problems before they really become a tragedy.

Thank you again, Mr. Chairman, for the opportunity to appear before you, and I will gladly take questions at the appropriate time.

[The prepared statement of Mr. Pyle follows:]

PREPARED STATEMENT OF JASON PYLE, CHIEF EXECUTIVE OFFICER, SAPPHIRE ENERGY, INC., SAN DIEGO, CA

Mr. Chairman and members of the Committee, thank you very much for inviting me to participate on this important panel, and on this critical issue.

First, let me thank the Committee for its leadership on alternative, renewable fuels. Your keen focus and vision have resulted in the first ever Renewable Fuel Standard. Although there will inevitably be elements of RFS that will improve over time, you've guided the country along on the right path. Second, within the RFS debate, I want to thank this Committee for its vision and support for technology neutrality in RFS legislation, even though that vision did not survive final passage. As you predicted by supporting a technology neutral position, we are now seeing the evolution of an entirely new generation of renewable fuels. These fuels transcend the use of food as fuel feedstock. The current dilemma that pits fuel against food is just the first of many consequences of a technology-specific RFS. Without a technology-neutral RFS, this nation will not meet its goals of providing 32 billion gallons of renewable fuel by 2022. Although last year's Energy Independence and Security Act has yet to foster such solutions, this Committee should be applauded for anticipating an ever-expanding universe of alternative and renewable fuels.

That's why I am here. I'm Jason Pyle, Chief Executive Officer of Sapphire Energy. Sapphire is one of several of this nation's best technology companies working to produce the next generation of renewable fuels. At Sapphire, we focus on the production of current fuel products, such as gasoline, diesel and aircraft fuel, from completely renewable sources, such as photosynthetic microorganisms, or algae. Our mission is to produce fuels for today's oil and gasoline infrastructure, and two weeks ago we announced that Sapphire had produced the first ever renewable, ASTM-compliant, 91 octane gasoline from microorganisms. Please refer to the attached two documents for more background on Sapphire Energy.

THE PROBLEM

One of the many reasons we have cheap food is the availability of cheap energy. We cannot expect to turn large amounts of food back into energy in an economic manner. In today's debate between food and fuel, we should not have to make a choice. Both are critical to the economy, the environment and the world at large; we should not match one against the other. But when price and demand rise for

one, both suffer. Instead of a Pyrrhic choice between food and fuel, I offer the opportunity to transcend the debate and produce ample supplies of both, leading this nation toward energy independence. Instead of a dispute between two basic necessities, we need a dialogue that supports truly sustainable alternative fuel sources.

Over the past year we have all seen prices and demand rise for commodities such as corn, sugar and vegetable oil. The entire world now feels the pressure. Daily we are faced with reports of people who struggle to afford essentials. A host of factors has contributed to price increases for food and fuel: weather, heightened demand, a weaker dollar, decreasing supplies.

Just like energy, food is linked in a global market. Once we begin fueling our cars with food crops, we witness international repercussions. Riots occurred in Mexico earlier this year over expensive corn flour. This price increase has been attributed to U.S. demand for corn-based ethanol products, leaving less maize available for export. Protests over similar issues have occurred around the world, contributing to inflation and political instability.

Even at an increased rate of production, current domestic biofuel processes will meet part, but not all, of U.S. demand. If the entire annual domestic soybean crop of 3 billion bushels were converted to biodiesel at the current efficiency of 1.4 gallons per bushel, it would provide about 6.5% of U.S. diesel fuel production. Though certainly a valuable asset to our fuel supply, it is clear that a spectrum of additional and diverse biofuels sources will be necessary to fulfill demand.

Congress first adopted the Renewable Fuels Standard in 2005, but wisely recognized that neither biodiesel nor ethanol would be the final solution. It created the program as a bridge to a new generation of fuels, and established a system of incentives to create a marketplace for new technologies. Congress should consider whether the incentives are neutral and fair. Ask whether these mechanisms will lead to the support and development of fuels that will give America true energy independence. Congress should ensure that the next round of incentives can be applied to advanced technologies such as Sapphire's. American innovation is the heart of our people and our economy; I urge you to support this with additional legislation that promotes a technology-neutral RFS.

THE SOLUTION

Food for fuel concerns are real, but can be managed. Industries such as ethanol from corn and biodiesel from vegetable oil can continue to play an important role in the energy mix. However, if we intend to practically and economically reach the goals of the RFS, we must be ready to rapidly embrace new fuel technologies. We must call on American ingenuity and entrepreneurialism for the solutions.

When Congress passed the Energy Policy Act of 2005, it put the country on a path toward an energy future independent of imported resources. As Americans, we must support this vision. We should strive to maximize production, create fuel-efficient cars, reduce the amount of driving we do and, finally, develop alternatives to fossil fuels. All these efforts deserve increased support. But without a truly new source of fuel, the system will remain in turmoil, prices will soar and the conflict between food and fuel will persist.

Senators, my colleagues and I at Sapphire Energy have been thinking about this for a long time. We knew that an energy source based on agriculture would serve this country best as a stepping stone to a green energy future. We knew that energy requiring vast amounts of fresh water resources was not a viable option. And, finally, if we wanted to make a difference quickly, we knew we needed a fuel that could be transported and refined just like petroleum. Two years ago we asked ourselves, "In a perfect world, how should the next generation of fuel be produced and distributed?" These were our founding principles:

1. Fuel production must not use farmland. Period.
2. Fuel production must be carbon neutral.
3. Fuel production and delivery must use the existing petroleum infrastructure.
4. Fuel production must scale domestically to reach tens of billions of gallons per year.
5. The next generation of fuels must be compatible with today's vehicles.

That sounded like a tall order. But Americans have dreamed big and delivered in the past—atomic energy, highways and railroads that crisscross our nation, a man on the moon, mapping the human genome. Now, a similar ingenuity has developed a completely renewable and homegrown source of gasoline. I offer that we do not have to sacrifice food production for fuel production. We do not have to choose between powering our industries and feeding the hungry.

The Sapphire processes and technologies are so revolutionary that the company is at the forefront of an entirely new industrial category called "Green Crude Production". Products and processes in this category differ significantly from other biofuels because they are made solely from photosynthetic microorganisms, sunlight and CO_2; do not result in biodiesel or ethanol; enhance and replace petroleum-based products; are carbon neutral and renewable; and don't require any food crop or agricultural land. The Sapphire process produces a replica of light sweet crude, green crude that can be used in traditional refining to make real gasoline, diesel, and aircraft fuel. Our feedstocks produce 10 to 100 times more energy per acre than cropland biofuels. A side benefit of our process is that the microorganisms consume pollutants and convert them to fuel. Using the Sapphire process, we have dramatically altered the domestic energy and petrochemical landscape and avoided the food versus fuel debate.

Please allow me to reiterate, the Sapphire process does not create ethanol; it does not produce biodiesel; it does not use crops or valuable farmland. Sapphire fuel is the fuel we use today, the kind that is in your car or truck or airplane right now. It's gasoline, diesel and aircraft fuel. Senators, this is a solution. This is a truly renewable, truly sustainable, alternative fuel—"Sapphire's green crude oil".

This fuel, Sapphire fuel, is the world's first truly renewable petrochemical product, produced by converting sunlight and CO_2 into a renewable, carbon-neutral alternative to conventional fossil fuels, without the drawbacks of current biofuels.

This fuel is compatible with the current energy infrastructure—cars, refineries, and pipelines.

Sapphire's scalable production facilities will produce this fuel economically because production will be modular, transportable, fueled by sunlight, and not constrained by arable land, crops, or other natural resources. Sapphire has turned sunlight into gasoline.

THE GOVERNMENT'S ROLE

Governments often offer subsidies in areas in which they hope to create incentives for certain economic behaviors. Naturally, governments must act as arbiters to separate those who qualify from those who do not qualify for the subsidies. Unfortunately, sometimes those separations create an artificial division that prevents the subsidies from achieving their goal. The nation has asked for energy independence and cleaner fuel products. Thankfully, our lawmakers have responded and given us a Renewable Fuel Standard. Unfortunately, the artificial division of technology within that standard is hindering the most promising fuel technologies from developing alongside existing renewable industries. The nation asked for energy independence and cleaner fuel products, not a specific subsidy for a specific fuel process. If we want to have 32 billion gallons of renewable fuel in 2022, we are going to need every source of technology and development possible to deliver it. Please take the handcuffs off of innovation and allow all forms of renewable technology to participate in the Renewable Fuel Standard.

We at Sapphire are fortunate in that we receive financial support from top venture capital firms such as ARCH Venture Partners and Venrock, and from one of the world's largest and most visionary foundations, the Wellcome Trust. Not all emerging producers of green crude or renewable gasoline, however, will be so fortunate. By continuing to subsidize mostly the existing technologies instead of emerging alternatives, the government runs the risk of discouraging a real future of renewable energy.

I support technology neutrality when it comes to subsidies for renewable fuels. In other words, none of the technologies and products that would help achieve the RFS should receive favorable treatment—not biodiesel, not cellulosic ethanol, and not fuels from algae. A growing competitive market should separate winners from losers. A subsidy system should support a constantly changing landscape of fuel and fuel technology. I recommend a technology-neutral platform that supports criteria rather than specific feedstocks, fuels or fuel processes. I am offering a future that relies on non-arable, non-agricultural land; a future based on domestic fuel production and a supply of fuel we use today within 5 years time. I believe this will be an essential part of the renewable fuel landscape and I urge you to assist me and other innovative companies with technology-neutral legislation.

CONCLUSION

The unfortunate phrase "food vs. fuel" suggests a conflict, a dilemma. We have faced this dilemma because there have been virtually no viable alternatives to existing sources of fossil fuel. Until now. At Sapphire Energy, we can change all that.

This is the fuel that can address the food versus fuel dilemma by enabling ample production of both.

Thank you again, Mr. Chairman, for the opportunity to appear before you. I will gladly take questions from you and the Committee at the appropriate time.

ATTACHMENT.—SAPPHIRE ENERGY NEWS RELEASE

SAPPHIRE ENERGY UNVEILS WORLD'S FIRST RENEWABLE GASOLINE

Pioneering effort alters 'food vs. fuel' debate, supports American energy independence with revolutionary platform that harnesses microorganisms, sunlight, CO_2

Leading investors commit over $50 million to scale effort; production innovator Brian Goodall hired, team leader behind first biofuel 747 flight

Sonoma, Calif.—May 28, 2008—Sapphire Energy announced today they have produced renewable 91 octane gasoline that conforms to ASTM certification, made from a breakthrough process that produces crude oil directly from sunlight, CO_2 and photosynthetic microorganisms, beginning with algae.

"Sapphire's goal is to be the world's leading producer of renewable petrochemical products," said CEO and co-founder Jason Pyle, speaking from the influential Simmons Alternative Energy Conference. "Our goal is to produce a renewable fuel without the downsides of current biofuel approaches.

"Sapphire Energy was founded on the belief that the only way to cure our dependence on foreign oil and end our flirtation with ethanol and biodiesel is through radical new thinking and a commitment to new technologies."

The end result—high-value hydrocarbons chemically identical to those in gasoline—will be entirely compatible with the current energy infrastructure from cars to refineries and pipelines.

Not biodiesel, not ethanol. And no crops or farm land required

The Sapphire platform offers vast advantages—scientific, economic and social—over traditional biofuel approaches.

Company scientists have built a platform that uses sunlight, CO_2, photosynthetic microorganisms and non-arable land to produce carbon-neutral alternatives to petrochemical-based processes and products. First up: renewable gasoline.

Critically important, in light of recent studies that prove the inefficiencies and costs of crop-based biofuels, there is no 'food vs. fuel' tradeoff. The process is not dependent on food crops or valuable farmland, and is highly water efficient.

"It's hard not to get excited about algae's potential," said Paul Dickerson, chief operating officer of the Department of Energy's Office of Energy Efficiency and Renewable Energy "Its basic requirements are few: CO_2, sun, and water. Algae can flourish in non-arable land or in dirty water, and when it does flourish, its potential oil yield per acre is unmatched by any other terrestrial feedstock."

Scalability key to success

Sapphire's scalable production facilities can grow easily and economically because production is modular, transportable, and fueled by sunlight—not constrained by land, crops, or other natural resources.

"Any company or fuel that hopes to solve the biofuel conundrum must be economically scalable—and that requires conforming to the existing refining distribution and fleet infrastructure," said Brian Goodall, Sapphire's new vice president of downstream technology. Goodall led the team responsible for the highly visible, first-ever Virgin Atlantic "green" 747 flight earlier this year. In addition to a three-decade career in the petrochemical industry, he is a corporate inductee at the National Inventors Hall of Fame.

Domestic production a matter of national security, economic growth

A new domestic energy platform based on sunlight and CO_2 has the economic potential to herald a tectonic market shift as well as make the country more secure. Last year, the nation imported over $200 billion of foreign oil, and, with oil prices reaching record heights every week, that number is expected to increase dramatically. Protecting these strategic overseas interests is an increasingly expensive proposition.

"It is imperative, both economically and for national security reasons, that American companies figure out ways to produce oil here at home," said Sapphire cofounder Kristina Burow of ARCH Venture Partners, the company's founding investor. "Imagine if even a portion of the $200 billion we spend on foreign crude stayed here: The payoff in new jobs, and domestic economic growth would be huge."

Developments require new industrial category: Green Crude Production

In fact, Sapphire's processes and science are so radical, the company is at the forefront of an entirely new industrial category called 'Green Crude Production.' Products and processes in this category differ significantly from other forms of biofuel because they are made solely from photosynthetic microorganisms, sunlight and CO_2; do not result in biodiesel or ethanol; enhance and replace petroleum-based products; are carbon neutral and renewable; and don't require any food crop or agricultural land.

The final products meet ASTM standards and are completely compatible with the existing petroleum infrastructure, from refinement through distribution and the retail supply chain.

Leadership team stars in their fields

Sapphire's founders and leadership team includes top scientists in the fields of petro chemistry, biotechnology, algal production, plant genomics, and biogenetics. ARCH Venture Partners, with a long history of taking innovative life-science technologies to market, is the founding investor. ARCH is joined by the Wellcome Trust, the world's largest biomedical research charity, and Venrock, one of the oldest and most respected venture capital firms in the country. The strength of the syndicate is unparalleled: between ARCH and Venrock, they have launched well over 500 companies. Sapphire is also collaborating with the leading scientists and organizations in the field including the DOE's Joint Genome Project; University of California, San Diego; The Scripps Research Institute; and the University of Tulsa.

"Sapphire's interdisciplinary team hit milestones within three months that everyone thought were impossible," said ARCH managing director Robert Nelsen.

"We realized at that point we could change the world, so we sat them down and told them, 'the checkbook is completely open; tell us what you need'."

"When the Wellcome Trust made the decision to invest in Sapphire, we evaluated the energy landscape to find a solution with the potential to realistically address the world's current challenges in energy production," said Danny Truell, Wellcome's chief investment officer.

About Sapphire Energy

Sapphire Energy was founded to address the overwhelming inadequacies of current biofuel approaches and the profound costs of American dependence on foreign oil. The company has built a revolutionary platform using sunlight, CO_2 and microorganisms such as algae to produce renewable, 91 octane gasoline that meets ASTM standards; it is not ethanol and not biodiesel. Sapphire is led by an interdisciplinary team of entrepreneurs and experts in cell biology, plant genomics and algal production, as well as investors with long histories of taking innovative technology to market, including co-founder ARCH Venture Partners, along with the Wellcome Trust and Venrock. Sapphire's scientific supporters include Scripps Research Institute; University of California, San Diego; the University of Tulsa, and the Department of Energy's Joint Genome Project. The company is located in San Diego. For more information, visit www.sapphireenergy.com and www.greencrudeproduction.com.

About ARCH Venture Partners

ARCH Venture Partners is a premier provider of seed and early stage capital for technology firms, with a special competence in co-founding and building technology firms from startup. ARCH invests primarily in companies co-founded with leading scientists and entrepreneurs, concentrating in innovations in life sciences, physical sciences, and information technology. ARCH enjoys special recognition as a leader in the successful commercialization of technologies developed at academic research institutions and national laboratories. The company manages seven funds totaling over $1.5 billion and has invested in the earliest venture capital rounds for more than 120 companies over 22 years. Portfolio companies where ARCH was a co-founding or early investor include Illumina, Aviron, Impinj, Xenoport, Alnylam, Ikaria, Microoptical Devices, New Era of Networks, Netbot, Trubion Pharmaceuticals, Adolor, Nanosys, Caliper Life Sciences, Ahura, Xtera, Array Biopharma, Everyday Learning Corporation, Nanophase Technologies, and deCode Genetics, among others.

About The Wellcome Trust

The Wellcome Trust is the largest charity in the UK. It funds innovative biomedical research, in the UK and internationally, spending around λ650 million each year to support the brightest scientists with the best ideas. The Wellcome Trust supports public debate about biomedical research and its impact on health and wellbeing.

About Venrock

Venrock is a premier venture capital firm with offices in Menlo Park, New York, Cambridge, MA, and Israel. Originally established as the venture capital arm of the Rockefeller family, Venrock continues a seven-decade tradition of partnering with entrepreneurs to establish successful, enduring companies. Having invested $1.9 billion in 405 companies resulting in over 120 IPOs over the past 39 years, Venrock's investment returns place it among the top tier venture capital firms that have achieved consistently superior performance. With a primary focus on technology, healthcare, and energy, portfolio companies have included Adnexus Therapeutics, Apple Computer, Centocor, Check Point Software, DoubleClick, Gilead Sciences, Idec Pharmaceuticals, Illumina, Intel, Millennium Pharmaceuticals, Sirna Therapeutics, StrataCom, and Vontu.

ATTACHMENT 2.—GREEN CRUDE JET FUEL: ON SPEC, RELIABLE AND ENTIRELY DOMESTIC

The United States Air Force consumes over 3 billion gallons of fuel each year, which is more than half the fuel consumed by the U.S. Government. Nearly 90% of this fuel is used for aviation. Currently, the U.S. military aviation fuel supply is inextricably linked to commercial oil production. Yet domestic petroleum resources continue to dwindle year after year. With over 60% of the earth's proven oil reserves beneath the ground in the Middle East, the future of national defense is growing progressively more reliant on one of the world's most politically turbulent regions.

Competition for fossil fuel products will skyrocket over the next decade. Emerging economies have a greater dependence on GDP growth than developed nations, and China, with both rapid expansion and history's largest standing army, will soon outpace the U.S. as the world's dominant energy consumer. As most energy products are traded on an international commodities market, rising worldwide demand will strain fuel availability to all nations. We are already seeing markets fracture, as Asian nations aggressively negotiate special supply contracts with Middle Eastern and African producers.

The Department of Defense is aggressively pursuing technologies that will reduce our energy vulnerabilities and strengthen our national security. Secretary of the Air Force Wynn states, "The reliance on imported oil continues to threaten the economic, financial, and physical security of the nation, while the use of domestic fossil fuels contributes to nationwide pollution problems. The Air Force believes that development of renewable energy sources for facility energy is one important element of our comprehensive strategy."

The Air Force Office of Scientific Research and the Defense Advanced Research Projects Agency are studying how to produce cleaner jet propellants by adding plant oils. Both are looking at triglyceride oils, such as algae oil, as potential feedstocks because they do not emit any carbon during production. Sapphire stands ready to provide the best strains and the most advanced proteoic algae technology available today.

ENERGY SECURITY BY SAPPHIRE

Sapphire has developed a process to produce on-spec jet aircraft fuels. The core technology relies on Sapphire's Green Crude production. Green Crude is a product that can be used as a petroleum replacement in existing oil refineries to produce gasoline, diesel, and aircraft fuel. Rendering it yet more valuable to the United States Armed forces, Green Crude possesses these additional properties:

1. Green Crude can be produced entirely within the continental United States.
2. Green Crude is a perfect substitute for petroleum crude, and requires no change to existing aircraft or fuel infrastructure.
3. Production is stable and reliable.
4. It is economically competitive with fossil fuel products.
5. By adopting Green Crude, the U.S. Air Force would become the most environmentally friendly fuel consumer in the world.

Sapphire uses transgenic technology originally developed for the production of pharmaceuticals. We have modified the metabolic pathways of photosynthetic organisms to convert the energy from the Sun into pure hydrocarbon molecules. This product is Green Crude, a biosynthetic oil that can be introduced directly into the existing petroleum infrastructure to produce products chemically identical to current liquid transportation fuels.

Sapphire has assembled some of the Nation's most distinguished scientists, engineers, entrepreneurs, and investors to develop a completely integrated fuel production process that is independent of international petroleum resources.

Sapphire's R&D team has already proven the viability of Green Crude production, and we are currently at the research facility stage. Our process does not use food, fresh water or agricultural land, and thus is exempt from many of the recent concerns surrounding other biofuel production methods. Our photosynthetic organisms consume vast amounts of carbon dioxide as the building block for liquid hydrocarbon fuels, reducing greenhouse gases and providing a fuel that is carbon-neutral or carbon-negative.

Sapphire's development target, currently slated for New Mexico, is a facility capable of producing 10,000 barrels of Green Crude each day. Once the process has been demonstrated at this scale, Sapphire will improve and replicate the modular system to produce 200,000 barrels per day, providing the Air Force with a reliable domestic supply of aviation and transportation fuel.

The CHAIRMAN. Thank you for your testimony.

Dr. von Braun, go right ahead.

STATEMENT OF JOACHIM VON BRAUN, DIRECTOR GENERAL, INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE

Mr. VON BRAUN. Thank you, Mr. Chairman and members of the committee.

The high and unstable food and energy prices have led to a world food crisis because they are leading causes of inflation, especially in Asia, but also in other parts of the world, causing macroeconomic problems. They are affecting low-income countries where this contributes to political unrest and instability. Global markets for food are becoming increasingly disrupted through export stocks, export bans to protect domestic consumers. High prices are undermining nutrition and health among many of the world's poorest 2 billion people. All these crisis symptoms have long-term consequences.

Last week the International Grain Council reports an overall growth in the use of cereals for biofuels globally by 32 percent in the season 2007/8 and an estimated 31 percent growth in the coming year. The U.S. has a share of about 80 percent in the total world quantity of grains, including corn used for biofuels. The total quantity used globally this year is about 95 million tons, and that is large relative to world trade—total world corn trade is 100 million tons, so roughly the same amount—and also large relative to total world corn production, about 780 million tons.

Biofuels are not per se bad or good. There are smart technologies as we have just heard also in agriculture. Sweet sorghum is one such alternative. Imagine a sorghum plant where you have the sugar in the stem and the grain on top of it. You have both good things. You can produce the ethanol and still harvest grain. It is already in larger scale testing in fields in India.

In any case, the hungry poor cannot wait for getting relief from second-generation biofuels technology.

Let me come to the much disputed price effects. The study of my institute did a careful comparison between a simulation of actual demand for food crops as biofuel feedstock for the time period from 2000 to 2007 and compared that with the simulation of the biofuel growth at the rate of what we had in the 1990s. So it is a with versus without comparison, but taking the past trend forward in the demand for bio-ethanol sector.

The result is increased biofuel demand during the period 2000 to 2007 accounted for 30 percent—3, 0—30 percent of the increase in weighted average grain prices. Not surprisingly, the biggest impact was on corn prices for which increased biofuel demand is estimated to account for 39 percent of the increase in real prices. So if corn prices went up from $100 to $200, that is a 100 percent increase. Then $39 of these $100 were due to biofuels.

These are very conservative estimates as they portray price effects from market fundamentals only and not factor in indirect additional effects from speculation that accelerate the price effect in the more tight markets which we have today.

The grain-based biofuels would not be a problem if the world could draw on a pile of grain, but it does not have a pile of grain. Productivity growth in grain production has declined over the past 2 decades for complex reasons. A comprehensive policy response will be fundamental to address the world food crisis. Biofuels must be part of that.

Four actions need to be addressed with a sense of urgency.

First, cut back on biofuels that are based on grain and corn, including a freeze or a temporary moratorium. This would have fast impact on the markets.

Second, invest in agriculture crop productivity globally. That is investment in science and technology. The U.S. science system has a lot to offer here that would compensate for the use of grains in biofuels.

Third, markets and trade policies call for building a global system for biofuels markets and trade that is undistorted and operates with low transaction costs.

Finally, protection of the food-insecure poor which is a necessity given the current food crisis is upon them. Such protection would include employment programs, school feeding, cash and food transfers, et cetera. Without such a social component, the current food crisis cannot be addressed.

Thank you for your attention.

[The prepared statement of Mr. von Braun follows:]

PREPARED STATEMENT OF JOACHIM VON BRAUN, DIRECTOR GENERAL, INTERNATIONAL FOOD POLICY RESEARCH INSTITUTION

INTRODUCTION

World agriculture is at a turning point: economic growth, energy needs, and climate change redefine the equations of agricultural supply and demand and contribute to accelerate food prices. Biofuels have been particularly high on the global agenda largely due to rising concerns about national energy security, high energy prices, and global climate change, as well as the income expectations of farmers and other investors (von Braun and Pachauri 2006).

The International Grain Council reports an overall growth in the use of cereals by 32% in 2007/8 and an estimated 31% in the coming year, and by 41% and 32% in the USA respectively (see table 1). The USA has a share of about 80% in the total quantity. The total quantity used globally this year (95 Mill. Tons) is large, relative to total world trade of corn (100 Mill. Tons) and relative to total world corn production (777 Mill. Tons).

The rapid expansion of ethanol and biodiesel has increased dependency on natural vegetation and crops grown specifically for energy. Biofuel production has also introduced new food-security risks and new challenges for the poor, particularly when resource constraints have lead to trade-offs between food and biofuel production and rising food prices. For the further development and use of biofuels, it is necessary to carefully assess the impact of different technologies, products (ethanol, bio-diesel,

bio-gas), and feed stocks (e.g. sugar cane, corn, oilseeds, palm oil, agricultural waste and biomass).

Table 1: Utilization of Cereals for Ethanol production (2004/05 - 2008/09)

	2004/05	2005/06	2006/07	2007/08[1)]	2008/09[2)]	2007/08:06/07	2008/09:07/08
	in Million Tons					change in %	change in %
USA All	34,1	41,3	54,5	76,8	101,7	+ 40,9	+ 32,4
Corn	33,6	40,7	53,8	76,2	100,4	+ 41,6	+ 31,8
Sorghum	0,5	0,6	0,7	0,6	1,3	- 14,3	+ 116,7
EU-27	1,1	3,2	3,4	2,9	5,2	- 14,7	+ 79,3
Canada	0,5	0,7	1,5	1,8	2,5	+ 20,0	+ 38,9
China	6,5	9,5	11,0	11,5	12,0	+ 4,5	+ 4,3
Other countries	0,8	1,1	1,4	1,9	2,4	+ 35,7	+ 26,3
Total	43,0	55,8	71,8	94,9	123,8	+ 32,2	+ 30,5

1) estimate, 2) projection

Source: International Grain Council, June 2008

ENERGY AND AGRICULTURE IN A BROADER CONCEPTUAL FRAMEWORK

A comprehensive policy framework will be fundamental to developing biofuels in such a way that they contribute to energy security, climate change mitigation, and environmental sustainability, and at the same time they do not negatively affect food prices and the food security of the poor. The three main domains upon which biofuels have an impact-namely the political/social, the economic, and the environmental-interact when agriculture and energy become more closely linked through the production of biofuels (Figure 1).* This interaction will lead to changes in the dynamics of agriculture as well as changes in the impact on households, businesses, and the private sector.

Participants in the biofuel discussion come from many sectors and include farmer representatives, the energy industry, global environmental movements, large capital funds, and science and technology lobbies. The extent to which biofuels remain on the agenda will depend on political pressures and security concerns. High levels of rent seeking as well as political lobbying are part of the picture, and their impact can be seen in the current subsidy and trade policies adopted by some countries. The implemented biofuel subsidies are regressive and anti-poor because low-income households lose much on the food consumption side if food prices rise, and gain little on the energy side if energy prices decline.

The quantities of biofuels required to meet energy needs vary between countries and depend on the choice of feedstock. For example, if 20 percent of the maize crop in the United States were to be used for ethanol production, it would meet only one-third of the country's 10-percent ethanol blending target. On the other hand, if 20 percent of the sorghum crop in India were to be replaced with sweet sorghum, it would be sufficient to meet India's entire 10-percent ethanol blending target (Winslow 2008). Less-known crops such as Jatropha curcas and sweet sorghum also represent an area of opportunity for using marginalized lands and reducing greenhouse gases.

Whether biofuel production is a viable and sustainable source of energy depends not only on the choice of feedstock, but also on cultivation practices, technologies employed, or the security, trade, and environmental policies that are adopted. Many countries have already established ambitious biofuel expansion plans and blending targets, and yet biofuel production remains uncompetitive in many places of the world. Since second-generation biofuel technologies, which may lessen the food-fuel competition and the negative effects on the poor, are still a long way away, it makes sense for many countries to wait for the emergence of these technologies and "leap-frog" onto them later.

However, it is also important to recognize that technology may not necessarily overcome the food-fuel competition. The trade-offs between food and fuel may actually be accelerated when biofuels become more competitive relative to food with a further increased demand as a consequence. Therefore, it is not a question of either or: It is essential to simultaneously invest in energy and other agricultural tech-

*Figures 1–3 have been retained in committee files.

nologies to soften the trade-offs. The Consultative Group on International Agricultural Research (CGIAR) can play a vital role in this process.

BIOFUELS AND RISING FOOD PRICES

Feedstock makes up the principal share of total biofuel production costs. It accounts for 50-70 percent and 70-80 percent of overall costs for ethanol and biodiesel, respectively (IEA 2004). Net production costs, which refer to all costs related to production (including investments), differ widely across countries. For instance, Brazil produces ethanol at about half the cost of Australia and one-third the cost of Germany. However, feedstock costs have increased by 50 percent and more during the past few years, impinging on comparative advantage and competitiveness. While the biofuel sector will contribute to price changes, it will also be a victim of changes in feedstock prices.

The high price of energy is a key factor behind rising food prices. Energy and agricultural prices have become increasingly intertwined. With oil prices at an all-time high and the U.S. government subsidizing farmers to grow crops for energy, U.S. farmers have massively shifted their cultivation toward biofuel feedstocks, especially corn (see Table 1), often at the expense of soybean and wheat cultivation.

An IFPRI study by Mark Rosegrant (2008) did a comparison between a simulation of actual demand for food crops as biofuel feedstock through 2007 and a scenario simulating biofuel growth at the rate of 1990-2000 before the rapid takeoff in demand for bioethanol. This approximates the contribution of biofuel demand to increases in grain prices from 2000 to 2007. The percentage contribution of biofuel demand to price increases during that period is the difference between 2007 prices in the two scenarios, divided by the increase in prices in the baseline from 2000 to 2007. The increased biofuel demand during the period, compared with previous historical rates of growth, is estimated to have accounted for 30 percent of the increase in weighted average grain prices. The biggest impact was on maize prices, for which increased biofuel demand is estimated to account for 39 percent of the increase in real prices. Increased biofuel demand is estimated to account for 21 percent of the increase in rice prices and 22 percent of the rise in wheat prices (Rosegrant 2008).

Scenario analyses undertaken with IFPRI's International Model for Policy Analysis of Agricultural Commodities and Trade (IMPACT have examined the effects of biofuels on food prices as they may occur in the future. The developed scenarios include:

Scenario 1—based on the actual biofuel plans of countries and biofuel expansion for identified high-potential countries. Under this scenario prices increase ceteris paribus by 18 percent for oilseeds and 26 percent for corn by 2020.

Scenario 2—based on a more drastic expansion of biofuels, assuming a doubling of the production expansion rate over Scenario 1 levels. Under this drastic biofuel expansion scenario (Scenario 2), the price of corn rises by 72 percent and of oilseeds by 44 percent.

WOULD THE POOR GO EVEN HUNGRIER WITH MORE BIOFUEL PRODUCTION?

Poor people are impacted by biofuels as consumers in food and energy markets, producers of agricultural commodities in small businesses, and workers in labor markets. The increase in agricultural demand and the resulting increase in agricultural prices will affect poor people in different ways. Some poor farmers could gain from this price increase. However, net buyers of food, which represent the majority of poor people, would respond to high food prices with reduced consumption and changed patterns of demand, leading to calorie and nutrition deficiencies.

Under the two IMPACT scenarios, the increase in crop prices resulting from expanded biofuel production is also accompanied by a net decrease in availability and access to food. Calorieconsumption is estimated to decrease across regions under all scenarios compared to baseline levels (Figure 2). Food-calorie consumption will fall the most in Sub-Saharan Africa, where calorie consumption is projected to decrease by more than 8 percent if biofuels expand drastically.

As a result of rising food prices, cuts will likely be made to food expenditures, exacerbating diet quality and micronutrient malnutrition. A study of the effects in an East Asian setting suggests that a 50-percent increase in the price of food, holding income constant, will lead to the decline of iron intake by 30 percent. As a result, the prevalence of micronutrient deficiency among women and children will increase by 25 percent (Bouis 2008). Studies also show that current malnutrition of mothers and children has long lasting effects (Lancet 2008) and will show in deteriorated health and income decades later.

IMPLICATIONS FOR POLICY

A comprehensive policy framework will be fundamental to developing biofuels in such a way that they contribute to energy security, are environmentally sustainable and that complementary policies protect the pro-poor as long as grain based biofuels contribute to high food prices. Such a framework requires a strategic approach with three pillars:

1. Science and technology policy , which calls for accelerated agricultural productivity to maintain and improve food security, accompanied by an expanded focus on agricultural and biofuel technologies and close coordination with biofuel users-for example, the automobile industry.
2. Markets and trade policy, which calls for building a global system for biofuel markets and trade that is undistorted and operates with low transaction costs. Transparent standards are needed, including sustainability and performance-based standards rather than technology-based standards that will quickly become outdated.
3. An insurance and social-protection policy for the food-insecure poor, which is a necessity given existing large-scale food and nutrition insecurity and the growing number of changes in the food system which are partly driven by the expansion of biofuels. Such protection could include employment programs, school feeding and food for schooling programs, conditional and unconditional cash transfer programs, and social security systems for the poorest.

The CHAIRMAN. Thank you very much for your testimony.

Mr. Huttner, you are the final witness. Go right ahead.

STATEMENT OF JACK HUTTNER, VICE PRESIDENT, BIOREFINERY BUSINESS DEVELOPMENT, GENENCOR, ROCHESTER, NY

Mr. HUTTNER. Thank you, Chairman Bingaman and the committee, for this invitation today. I am here on behalf of my company, Genencor, a division of Danisco, and the Industrial and Environmental Section of the Biotech Industry Organization, of which Genencor is a longstanding member.

We are a leading industrial biotechnology company specializing in biotech enzymes for the ethanol, detergent, textile, and feed industries.

BIO's members include enzyme companies like ours, oil companies, first and second-generation biofuels companies, and dedicated energy feedstock developers.

Each of us is working to deliver products that enhance agricultural productivity, energy security, and boost the rural economy, contributing to a more sustainable bio-based economy.

I wanted to start by thanking you and your colleagues in Congress for your continued support of the emerging biofuels industry here in the U.S. The Renewable Fuels Standard included in the energy bill this year and the biofuels provisions in the farm bill are essential to the shared vision we have of a strong, sustainable economic future.

I have submitted prepared testimony and I will just summarize my remarks briefly.

As other speakers have commented today, the biggest cause of higher food prices is the cost of energy, particularly oil. Some small measure of the price increase likely can be attributed to the production of ethanol in the U.S. We admit that. While it is minimal, the question I would like to address today is how we can reduce that impact further. More importantly, how do we provide the world's growing population with abundant supplies of food while also meeting our growing energy needs?

First will be increasing agricultural yields here and around the world. Over the past 30 years, new hybrid and biotech varieties of corn, for example, have increased corn yields from 90 bushels to nearly 150 bushels per acre, and we are on our way to delivering 200 bushels per acre in this next decade. The consulting company McKinsey estimates that if current yield trends continue, no additional acres of corn will be needed to meet the 15 billion gallons of conventional ethanol required by the RFS.

One big problem we face today is the huge fall-off in yield seen in developing economies. Indeed, the worldwide average yield per acre is just 50 percent of the United States. There was an interesting story in Tuesday's Wall Street Journal reporting on changing attitudes among development agency economists who are now revising their thinking to conclude that investments in agriculture will improve, not thwart economic development. Policy and investment should focus on spreading technologies to improve yields here and around the world. We have no doubt that sustainable agricultural development can provide both abundant food and biofuel.

The second big development that gives us confidence is the emerging second-generation biorefinery. Just last month, for example, DuPont and Genencor announced a joint venture to produce cellulosic ethanol. This technology will use non-food portions of the corn crop, namely cobs and corn stalks, to make ethanol. In the U.S., we will deploy this technology directly to the current ethanol industry by offering bolt-on units. This strategy uses the existing ethanol infrastructure to bring cellulosic ethanol to the market just as quickly and as efficiently as possible. By using these agricultural residues, we can greatly increase the volume of ethanol produced from an acre of land. That is why the infrastructure being developed for today's ethanol industry is so vital to second-generation biofuels. Our pilot plant will be operating in 2009, and within 5 years, we plan to be producing commercial volumes.

Beyond corn, we are also working with other companies in BIO to prepare for dedicated energy crops like switchgrass. The first commercial switchgrass seeds will be available next year for planting. Of course, other biomass feedstocks like wood chips, forest thinnings, and sugar cane are all targets for sourcing renewable carbon.

Many BIO member companies are also working aggressively to commercialize other advance biofuels such as bio-butanol. Several cutting-edge companies are even developing renewable hydrocarbons to make gasoline and diesel from carbohydrates and algae.

Cellulosic ethanol is on the verge of becoming a viable industry. Longstanding support of the U.S. Government for basic research, applied R&D, and demonstration facilities will soon be paying off. Congressional authorization and funding of the USDA and DOE, for example, have made the transition to cellulosic ethanol possible. These investments and the policy framework provided by the recently enacted energy and farm bills have laid the groundwork for a new, low-carbon economy that uses renewable carbon from biomass to replace fossil carbon for the production of fuels and chemicals.

In the future, biorefineries will be scattered throughout the rural landscape. This is the promise we see of the bio-based economy. We

are at the beginning of the journey, not the end. 10 years from now, second-generation biorefineries will produce a variety of products and liquid fuels, but today's ethanol plants and the infrastructure supporting them is the foundation we will be building upon. Without a robust, stable policy framework, the journey is going to be much more difficult, if not impossible. We hope Congress will not be persuaded by our critics to reverse the biofuels policy you have worked so hard to develop and enact. We must keep the RFS in place, staying on course to realize the great commercial and environmental potential that a bio-based economy can bring.

Thank you for your attention and the invitation today.

[The prepared statement of Mr. Huttner follows:]

PREPARED STATEMENT OF JACK HUTTNER, VICE PRESIDENT, BIOREFINERY BUSINESS DEVELOPMENT, GENENCOR, ROCHESTER, NY

I would like to thank the committee for inviting me to testify today. I am here on behalf of my company, Genencor, a division of Danisco A/S, and the Industrial and Environmental Section of the Biotechnology Industry Organization—BIO, of which Genencor is a long-standing member.

Genencor is a leading industrial biotechnology company with over 1500 employees around the world. Our specialty is the development and production of biotech enzymes for the ethanol, detergent, textile and feed industries.

BIO's members include enzyme producers, like Genencor, as well as agricultural seed companies, oil companies, first and second generation biofuels companies and dedicated energy feedstock developers. Each is helping to deliver technologies that enhance agricultural productivity and energy security, boost the rural economy and deliver a cleaner environment.

I wanted to start by thanking you and your colleagues in Congress for your continued support of the emerging biofuels industry in the US. The Renewable Fuels Standard included in the 2007 energy bill and the biofuels provisions in this year's farm bill are essential to the shared vision of a strong, sustainable future in which America's farmers continue to produce abundant supplies of food and feed while also helping to meet our growing energy needs. We at Genencor, and our colleagues in BIO, are working hard to help make this vision a reality.

Recently, the media has been full of stories linking food price increases to ethanol production. This is a false debate. We have the ability to produce both food and biofuels in abundance. Many commentators have noted the various factors driving global food price increases, including dramatically rising oil prices, booming demand for animal feed in China and India, drought in agricultural producing regions and the weak US dollar. And yes, biofuels production, although experts have repeatedly pointed out that biofuels production is a relatively minor cause of food price increases. I would note that the prices of agricultural commodities that have little or no relationship to biofuels, such as rice and wheat, have risen right along with corn and soybeans. As Dr. Otlaw has testified, the study recently released by Texas A&M University found that the primary underlying force driving price increases in the agricultural industry, as with the economy as a whole, is higher energy prices—$100 + per barrel oil in particular—and that somehow freezing, rolling back or eliminating the RFS would not result in significantly lower corn or food prices. In fact, Merrill Lynch estimates that without ethanol, gasoline prices would be at least 50 cents higher than they are today, further exacerbating the pressures on food and commodity prices.

There is another story that the media has not been telling so effectively—the story of steadily increasing agricultural productivity. We have seen a decade's long year-on-year crop yield improvement. And, we are about to see a dramatic increase in that rate of improvement in the near future. New plant varieties are steadily becoming more drought and pest resistant and more efficient in their use of fertilizer. Yields, the amount of corn, soybeans, or other product per acre, are rising steadily. This is partly why we believe there is no long term food and fuel tension. In the last decade global production of corn has risen almost 35%, and soybeans over 50%. That increased production was achieved with only a 6% increase in planted acres—that is the power of increasing yields, which act like compounded interest adding more production each and every year. In the mid-1970s America was producing about 90 bushels of corn per acre. Today, just 30 years later, that number has increased to 150 bushels per acre, and we are on our way to 200 bushels per acre

in the next decade. In fact, McKinsey & Company estimates that if current biotech-based yield trends continue, no more additional acres will be needed to meet the 15 billion gallons of conventional starch based ethanol required by the RFS.

Improving agricultural yields have not been uniformly achieved, however. Many parts of the world are still using agricultural practices that are many decades old, and have agricultural yields one quarter that of the US. Indeed, the world wide average corn yield per acre is 50% of the yield in the US. In some countries, corn yields are below 30 bushels per acre, just one-fifth of ours. On Tuesday, the Wall Street Journal featured a story on the food crisis. The story reported on new thinking by development agencies that have refocused attention on the need for increased investment in seeds and fertilizers in the developing world. The real policy focus should be on how to help other parts of the world such as Africa, Eastern Europe and Asia, expand agricultural productivity. There is huge upside opportunity in agricultural productivity from the existing acreage. We can grow our way out of this if we can expand the distribution of agricultural progress.

In addition to our contributions to increase yield, the US biofuels industry is on the verge of commercializing second generation technologies that will use non-food feedstocks, like corn stover, switch grass and waste wood. Indeed, Genencor and DuPont have just formed a joint venture to develop this technology and we hope to have our pilot plant operational next year. Within five years, we expect to be producing commercial quantities of cellulosic ethanol. Is there enough biomass to produce a significant amount of second generation biofuels? To answer this question, BIO recently produced a report on the sustainable harvest of cellulosic biomass for biorefinery feedstock. Based on published USDA data, it concluded that farmers could supply over 200 million dry tons annually of corn stover, enough feedstock to double ethanol production from America's corn acres. Much of this biomass will be processed at existing ethanol facilities retrofitted to handle cellulosic feedstocks in addition to grain. That's why the infrastructure being developed for today's ethanol industry is so vital to the next generation as well.

Everyone understands the impact of higher commodity input costs that we all face. I am very concerned, however, that critics of biofuels and the RFS are pointing the finger of blame at the wrong culprit. If Congress over-reacts, our ability to bring next generation biofuels to market could be badly damaged. We need the RFS to set the floor for biofuels demand so companies like Genencor and DuPont will continue to invest in second generation biorefineries. BIO's member companies believe the RFS is the right standard, at the right time, for the right reasons.

Of course, we can't simply depend on corn alone. In addition to agricultural residues, BIO member companies like Ceres and Mendel are developing dedicated energy crops like switchgrass and Miscanthus as biorefinery feedstocks of the near future. In fact, Ceres just introduced the first commercial switchgrass variety that will be on the market at the end of this year. These crops will bring new revenue to farmers, increase biomass yield per acre with the lowest possible water and energy inputs per ton.

Cellulosic ethanol is on the verge of becoming a viable industry. The long standing support of the US Government for basic research, applied R&D and demonstration facilities will soon be paying off. Congressional authorization and funding of the USDA and DOE, for example, have made the transition to cellulosic ethanol possible. These investments have laid the groundwork for a new, low-carbon economy. This is an economy that uses renewable carbon from plants to replace fossil carbon for the production of fuels and chemicals in addition to food and fiber.

This is about more than just ethanol. Many BIO member companies are working aggressively to commercialize other advanced biofuels, such as the bio-butanol that DuPont is developing with BP. Existing ethanol infrastructure can be retrofitted with this technology. Several cutting-edge companies are developing "renewable hydrocarbons" to make gasoline and diesel from carbohydrates and algae. In the future, biorefineries will be scattered throughout the rural landscape converting biomass into many different products, all with a reduced life cycle carbon footprint. This is the promise of the biobased economy.

Perhaps the history of the oil refining industry is informative to the current biofuels debate. It was in 1853 that the first petroleum product—kerosene—was produced from seep oil to replace whale oil. It has taken over 150 years for the modern oil refinery to evolve from that point to where it can take in a barrel of crude oil and produce a myriad of downstream products.

Modern biorefineries are at about that stage of development. We are at the beginning of the biorefinery journey—not the end. Twenty years from now, modern biorefineries will use a variety of renewable feedstocks and produce a variety of products and liquid fuels. But the ethanol plants we are building today, and the infrastructure supporting them, is the foundation we will build upon. Without a robust

and stable policy framework, the journey will be much more difficult, if not impossible. We hope our Congressional leaders will not be stampeded by the chorus of negativity that seeks to reverse the biofuels policy Congress has worked so hard to develop and enact. We must keep the RFS in place and stay on course to realize the great commercial and environmental potential that a biobased economy can bring. Thank you.

ATTACHMENT.—BIOFUELS MYTHS AND FACTS

THE TECHNOLOGY

Myth: Ethanol takes more energy to produce than it provides in the tank

FACT: This anachronism has been disproven by a number of researchers. According to scientists at Argonne National Laboratory, today's ethanol production provides roughly 50 percent more useful energy per unit of fossil energy input than gasoline. Cellulosic ethanol is expected to provide a 10:1 return on fossil fuel investment.

Myth: The Renewable Fuels Standard (RFS) in the 2007 energy bill is too aggressive

FACT: Over 13.5 billion gallons of ethanol capacity is either already installed or under construction. The RFS does not reach 13 billion gallons until 2010 and caps conventional ethanol production at 15 billion gallons in 2015 and beyond.

Myth: Commercialization of cellulosic biofuels technology is still over a decade away

FACT: The world's first commercial cellulosic ethanol plants are already under construction and will come on line beginning in 2008. Projects under construction include:

- Abengoa Bioenergy (Salamanca, Spain)
- Verenium (Jennings, Louisiana)
- Mascoma (Rome, New York)
- Range Fuels (Soperton, Georgia)

More than 20 other cellulosic biorefineries are in advanced planning or permitting stages.

FACT: Commercially-ready cellulase enzymes have already been introduced, and commercially available seed for switchgrass and other next-generation energy crops will be available later this year. Genencor, A Danisco Division, introduced Accelerase, the first commercial cellulase enzyme, earlier this year. Ceres, Inc, recently introduced Blade, the first commercial energy crop seed line, which will include varieties of switchgrass and sorghum.

FACT: Six DOE-sponsored cellulosic demonstration biorefineries are moving forward and will be on-line in time to meet the first modest production requirement of 100 million gallons in 2010. Seven additional pilot biorefineries have received DOE grants to prove out emerging technologies. In total, 29 advanced biofuel refineries are planned or under construction.

FOOD AND FUEL

Myth: Biofuels production is responsible for the global food crisis

FACT: The primary crops of concern for global food shortages are rice and wheat, very little of which is used for biofuels. Poor harvests and increased demand globally of rice and wheat have resulted in tighter supplies.

FACT: Biofuels production has not reduced exports of food or feed. U.S. corn exports reached record levels in 2007-08, and biofuels producers added over 1 billion bushels of dry distillers grains (DDGs) to the feed supply last year. Soybean exports are up as well. The U.S. livestock industry is still the top user of corn, with more corn expected to be fed to livestock this year compared to last.

FACT: With the help of biotechnology, corn crop yields have increased over 30 percent since the technology was introduced in 1996, and yield increases are expected to continue into the future. Soybean yields have increased over 20 percent in the same time period.

FACT: Responsible, sustainable biofuels production will be an increasingly critical component of global security in the coming century, expanding global energy supplies, reducing dependence on petroleum, cutting greenhouse gas emissions, and creating economic opportunity in rural and developing regions. Biofuels are not a panacea, but are a vital part of the global energy future.

Myth: Biofuels are causing a dramatic rise in food prices

FACT: Energy prices have been the largest single driver for higher food prices and a new study from Texas A&M shows that other factors—primarily skyrocketing prices for fuel and fertilizer, but also drought, population growth, the weakening dollar, political instability, and speculation by hedge fund and other investors—are the primary causes of recent food price increases around the world.

FACT: In addition to the above factors, corn prices have increased due to increased demand for animal feed in developing countries such as India and China with growing middle class demand for meat.

FACT: In the United States, farm costs account for only 19 cents of every dollar of retail food costs. Energy and labor are the dominant food costs to consumers. In fact, Merrill Lynch estimates that without ethanol production, fuel costs would be 15 percent higher than they are today, driving the cost of producing food and feed even higher.

FACT: Biotechnology is already playing a role in helping to meet growing demand for biofuels through increased yields of corn and soybeans. Higher yields mean more grain for food and fuel. These year-over-year yield increases are expected to continue or even accelerate into the foreseeable future.

LAND USE

Myth: There's not enough land to produce food, feed and biofuels

FACT: A 2005 analysis by the Departments of Energy and Agriculture found that there is enough biomass in the United States to displace over 30 percent of U.S. gasoline demand without reducing production of food and feed. Today's biofuels production represents less than 5 percent of the transportation fuel supply.

FACT: There are nearly 5 billion acres of agricultural cropland in production worldwide. Less than 2.5 percent of that land is used for the production of feedstocks for biofuels.

FACT: Bioenergy crops can provide food/feed, fuels, and other high-value co-products from the same crop, making the highest possible use of the land.

FACT: Advances in agricultural and industrial biotechnology are constantly increasing biofuel yields, making increasingly efficient use of existing lands. Introduction of biotech varieties has helped increase corn yields 30% since 1996 alone. McKinsey & Co. estimate that if current corn yield improvements continue, zero additional acres will be required to meet the new Renewable Fuels Standard of 15 billion gallons of conventional ethanol.

FACT: Many energy crops grow well in poorer soils, and can be planted on less productive land, building soil and sequestering carbon in the process.

Myth: Biofuels production is destroying the rainforest

FACT: Only one percent of arable land in Brazil is planted with sugarcane. Sugarcane for ethanol is not grown in the Amazon rainforest. The Brazilian government has laws in place to protect deforestation of the Amazon rainforest.

FACT: Some critics (such as Searchinger) have recently suggested that biofuels—by driving up grain prices—are making it more lucrative to grow soybeans, and are therefore indirectly causing rainforest to be chopped down to make way for agricultural land. Brazilian rainforest is cleared for a complex mix of economic reasons, unrelated to ethanol production. Sustainable biofuels production must go hand-in-hand with sustainable land use policy.

SUSTAINABILITY

Myth: Biofuels increase greenhouse gas emissions

FACT: The vast majority of research from academia, NGOs, and federal labs suggests that biofuels have a positive and increasingly beneficial impact on climate. (See reference list.) Today's corn starch ethanol reduces GHG emissions up to 30 percent compared to gasoline, according to Argonne National Lab. Cellulosic ethanol is expected to reduce emissions by 85 percent or more.

The ethanol produced in the United States in 2007 reduced greenhouse gas emissions by approximately 10 million tons—the equivalent of removing more than 1.5 million cars from America's roadways—according to Argonne National Lab.

FACT: New fractionation and enzyme technologies are reducing biorefinery energy inputs and delivering higher value co-products. Biorefineries are also increasingly using renewable energy such as stover or animal waste to power their facilities, greatly reducing fossil fuel consumption. Cellulosic biorefineries are expected to require little or no fossil inputs, and may even return power to the grid.

FACT: Biotech corn varieties, collection of agricultural residues, and use of non-food feedstock crops all allow for greater adoption of no-till farming, which can in-

crease carbon sequestration in the soil 2-3 fold. Many non-food feedstock crops continuously sequester carbon even as above-ground biomass is harvested.

FACT: No-till farming actually results in carbon sequestration further improving GHG profiles.

Myth: Biofuels consume vast quantities of water

FACT: 87 percent of U.S. corn acres are non-irrigated, requiring no water other than natural rainfall. Ag biotech companies are developing new drought-resistant corn varieties, which will further reduce water inputs.

FACT: Many non-food feedstock crops, such as perennial grasses, are highly drought tolerant, and will require little or no water inputs.

FACT: One gallon of ethanol requires approximately 3 gallons of water to produce today. This number is constantly improving as biorefineries become more efficient. This is roughly the same amount of water required to produce a gallon of gasoline. For comparison, a gallon of beer takes 40 gallons of water.

Myth: Biofuels require massive amounts of fertilizer and pesticides

FACT: Ag biotech has helped corn farmers become far more efficient in their fertilizer and pesticide applications. Insecticide usage has declined over 80 percent per acre in the past 20 years. Nitrogen and phosphate applications have declined roughly 30 percent per bushel in the last 30 years. Increased use of conservation tillage has substantially reduced runoff of all inputs.

FACT: Many non-food feedstock crop varieties would require little or no fertilizer or pesticide inputs.

ECONOMICS

Myth: Ethanol subsidies are a huge waste of taxpayer dollars

FACT: The ethanol industry generated an estimated $4.6 billion in tax revenue for the federal government in 2007, or $1.35 for every dollar of federal investment.

FACT: Merrill Lynch estimates that U.S. gasoline prices would be 15 percent—roughly 50 cents a gallon—higher without current ethanol production.

FACT: The 36 billion gallon RFS is expected to add more than $1.7 trillion to the GDP, create up to 1.1 million new jobs, and reduce the outflow of dollars to foreign oil producers by $817 billion over the next 15 years.

FACT: A typical 100 million gallon per year ethanol plant adds $367 million to local GDP and boosts local household incomes by an additional $100 million.

ENERGY

Myth: Biofuels can only supply up to 10% of our transportation fuel needs so they are not worth pursuing

FACT: According to the Natural Resources Defense Council, the United States can produce enough sustainable biofuels to supply half of U.S. transportation fuel needs—100 percent if vehicle fuel economy doubles.

SAMPLE REFERENCES SHOWING LIFECYCLE BENEFITS OF BIOFUELS

http://www.transportation.anl.gov/pdfs/TA/271.pdf

http://www.nrdc.org/air/energy/biofuels/contents.asp

http://www.pnas.org/cgi/content/abstract/105/2/464

http://www.esajournals.org/perlserv/?request=get-abstract&doi=10.1890%2F05-2018&ct=1

http://www.sciencemag.org/cgi/content/short/311/5760/506

http://www.bio.org/ind/biofuel/SustainableBiomassReport.pdf

http://www1.eere.energy.gov/biomass/pdfs/final__billionton__vision__report2.pdf.

The CHAIRMAN. Thank you for your testimony.

Let me start and we will just have 5-minute rounds of questions here. We have a lot of Senators that obviously are interested and have questions.

Let me start by talking just a little bit about this whole issue of corn production. Obviously, we are all very concerned about the tragedies that we are seeing throughout the Midwest, last night's tragic tornadoes in Iowa and Kansas, recent flooding in the corn-producing areas of our country. I think, Dr. Glauber, you referred

to the fact that we have got some reports coming out, one on the 30th of June and another later than that, which are going to be closely watched because people are concerned that perhaps some of these weather-related factors, along with everything else, could substantially reduce the corn crop this year.

I wanted to ask about the waiver authority that we have in this RFS. When it was enacted, there was an effort made to provide, I think, to the Administrator of EPA authority to waive part or all of the RFS if certain determinations were made. I would just be interested in your interpretation of that waiver authority and, Secretary Karsner, yours as well, as to whether or not this is a—I mean, depending on what these reports say here later in the summer, is there a possibility that there would be an action by the EPA Administrator in that regard? Would it have any effect on the amount of corn that is going for production of biofuels?

Dr. Glauber.

Mr. GLAUBER. Yes. Let me take a quick shot at it.

You are right. There is authority under section 211 of the act to consider a waiver to the RFS. Indeed, I think it is pretty well known there is actually a request from the State of Texas to consider a waiver, and I believe by the 24th of July, EPA, in consultation with DOE and USDA, will make a determination on that waiver.

As far as the 2008 Renewable Fuels Standard is concerned, the standard sets a level of 9 billion gallons of ethanol. If you look at current production estimates by the EIA, the Energy Information Agency, they are projecting somewhere around 8.9 billion gallons of ethanol being produced in 2008. If you add to that potential imports that come in, also biodiesel production which would be applied toward that, it would appear that we are over the standard. So the waiver in effect, at least from our projections right now, would have no effect on whether or not that ethanol is produced.

Now, there is a caveat to that and that is what happens to the size of this year's crop. It is anyone's guess right now. I think it was reported by Joe and others currently while margins have declined for ethanol producers, they still currently are making money and still producing ethanol. At least by our lastest estimates, it does not look like ethanol production is being affected.

If prices were to rise extremely high because of a serious floodings or droughts or something like that, unforeseen right now, then if all of a sudden it were difficult or the margins were not there to produce ethanol, a mandated level would—indeed, you would have to have ethanol, and the price of ethanol would get bid up such that they would continue to produce over time.

I think that is the only circumstance and again fairly rare, a small probability at this point, but a lot depends on what we see in acreage. Right now we think 86 million acres was planted. If that is substantially under that, that would be an issue I think. If the corn yield looked substantially under what we are carrying, then I think that would be a potential cause for concern. But otherwise, we see this mandate as not being binding.

The CHAIRMAN. Secretary Karsner, did you have a point of view on this?

Mr. KARSNER. Yes, sir. It is actually complementary to my colleague's at USDA in the sense that their analysis is focusing on the now. So when you talk about no real interruption to the production of ethanol, you are really talking about installed capacity of existing ethanol production or planned production, if you will.

Our interest at the Department of Energy is in moving forward with actual metrics, as you know, since this Energy Committee put them in place, in terms of technological achievement for next-generation cellulosic and advanced biofuels. That actually means we need capital formation, equity investment, and stimulation in the debt markets.

So while it might not affect the net production capacity of already installed conventional corn-based ethanol, the simple word to define what the impact would be from a waiver is "devastation" to capital formation for advanced biofuels if we were to send an erratic or unreliable signal that we had political risk or change of law risk and noncontinuity for the projection going forward, which is actually not addressing the installed current corn-based capacity. But you have got to go through that precursor of production of ethanol today to get capital markets to invest, as they are today, as you have heard from these fine companies, in the ethanol sources from nonedible waste streams that we are working on at DOE.

The CHAIRMAN. My time is up.

Senator Corker.

Senator CORKER. I do not know that I was prepared to be so quickly asking questions. It is very unusual being where I sit on this committee.

Thank you, Mr. Chairman, for this hearing and for all of the witnesses for being here today.

Dr. Pyle, I would like for you, if you would, to talk a little bit about the lack of—focusing on one technology. To me that was the major drawback in the provisions that we put in place. We discussed, as you mentioned in the beginning of our hearings here, about being agnostic as it related to technology. We actually had some amendments looking at addressing that. I wonder if you could expand just a little bit more, knowing you only had 5 minutes to talk a little bit to this committee, about the fact if we were not so technology-specific, exactly what that would mean, if you will, about the innovation and investment.

Mr. PYLE. As you correctly pointed out, Senator, it really was the leadership of this group here that first proposed a technology-neutral position for the RFS. I thank you for that. Unfortunately, that is not how the legislation occurred.

Just to summarize the way that the current legislation supports the introduction of renewables is virtually every means by which you can produce ethanol as a fuel product from all the various different possibilities, including farm food products, cellulosic technologies, and a vague reference on biomass-produced diesel. So, unfortunately, it does not expand the concept of alternative fuels to basically any renewable feedstock to produce a renewable fuel product.

When Sapphire proposed that we would provide the Nation gasoline, there was a very specific reason why we proposed to provide the Nation gasoline. It is because we use it right now. We have the

infrastructure to support the use of gasoline. It became clear to us that the RFS does not support the introduction of renewable gasoline as a renewable product. That was quite upsetting to us, as it was to the many very visionary both entrepreneurs and financiers that support these kinds of projects.

When I talk about some of the visionaries, I talk about people like the Wellcome Trust who are very concerned about world food prices, like the venture capital organizations, Venrock and ARCH, who are willing to support technologies at risk, but we are really hoping that the wisdom of this is seen clearly that we need to support all technologies that could potentially lead to energy security.

Focusing on one technology is going to be fraught with problems along the way, as we have seen with the eruption of this food versus fuel debate. This will just be the first of them, I promise you.

What we need to do is open this up to what Americans do best, and what we do best is innovate in the face of a challenge.

Senator CORKER. If you could—I am going to run out of time—but, say, in 15 seconds or so, give the attributes of how we might address that. In other words, if we said 36 million gallons and we defined what we were using, what would we say?

Mr. PYLE. I think that what needs to happen is that we need to define what exactly is renewable, and then we need to leave it open to technologists and entrepreneurs to provide fuels and processes that meet the definition of what is renewable, not specify a technology or a fuel. That is kind of where we are today. We have a specified fuel, which is ethanol, or a specified set of technologies like the conversion of soy to biodiesel. So we need to be more broad about what is renewable and allow all things which are renewable into the fuel mix.

Senator CORKER. I could not agree more, and I hope we can work with you and other members of the committee to see that that happens. That alone would be a way, would it not, of addressing the issue we are talking about right now as it relates to the relationship between fuel and food? That would easily do that. Is that correct?

Mr. PYLE. I completely agree with that.

Senator CORKER. That would be a responsible market response to the issue today. Is that correct?

I see our Government officials are actually shaking their head agreeing with an entrepreneur, which is most pleasant to see.

As a matter of fact, one of the things that I think is most awkward about talking about our energy policy here and most unpleasant is the very thing we are talking about right now, and that is we continue to pick winners and losers. To me, what I saw last week with the climate change debate was an opportunity—and hopefully that will come back up—to stop picking winners and losers. Let us figure out what is acceptable in this country as it relates to carbon, and then let us quit picking winners and losers. Let us do away with many of the subsidies. We have people who come in and out. I know new technologies need some on the front end, and I do not want you to frown, Dr. Pyle. I realize that.

But I want to ask the two Government witnesses how they would feel about on ethanol in general, corn ethanol in specific, but eth-

anol in general—we have tariffs today. We have tax credits today. Yet, we had corn ethanol suppliers in here telling us that they needed a floor on petroleum at $40 a barrel in order to be successful. We are at $138 or so a barrel. What would happen in the marketplace if we were to do away with one or both of those in your opinion?

The CHAIRMAN. Why don't you answer those questions and then we will take a short recess.

Mr. KARSNER. Senator Corker, you are exactly right. I would rather not comment on the precision of the mechanism, whether it is cap and trade, whether it is taxes, whether it is subsidies, but talk to the principles that you are asserting. The Administration is in complete agreement with you that we have got to get to a consolidated, single point of stimulus that is technology-neutral, predictable, long-term, and that includes the attributes that we seek as a Nation, the security externalities, and carbon weighted. So whatever mechanism or manifestation that comes in, those core principles of simplification and consolidation into a single set that cultivates the conditions for the results rather than selecting the technologies is where we have to go.

I would call your attention to the original proposal of the Administration for the "20 in 10" that was sent to the Hill and included the 1992 definition of renewable fuels under the Energy Policy Act which in fact was all inclusive and generally technology-neutral. That may be something that could be revisited in the days and weeks ahead.

Senator CORKER. Thank you.

The CHAIRMAN. Dr. Glauber, did you want to make a comment? Then we will adjourn.

Mr. GLAUBER. Sure. I do think it is important to recognize, one, the recently passed farm bill actually brings the blender credit down from 51 cents to 45 cents. My understanding is that will get implemented in 2009.

There is no question at $130 oil, ethanol is probably profitable without the subsidy. The real question is what happens when the price of oil falls back to the levels that we saw a year or 2 ago. There is no question that the blender credit has been very instrumental in helping to establish an industry.

So, yes, as far as the other duty and charge or the tariff, so-called tariff, for the ethanol, certainly that is an outlet to bring ethanol into this country. Ethanol made from sugarcane tends to be at lower cost than corn. But as we develop these new varieties and increase efficiency, there is no question that corn-based ethanol has seen very large cost savings and efficiency gains over the last 5–10 years.

The CHAIRMAN. Why don't we leave it at that? We will take a short recess. I think Senator Dorgan went to vote early, and when he comes back, he will reconvene the hearing. Thank you.

[Recess.]

Senator DORGAN [presiding]. We will call the hearing back to order. As you know, there is a vote occurring and the chairman will be back shortly.

Let me call on Senator Tester for inquiry.

Senator TESTER. Yes, thank you, Senator Dorgan.

I will jump around a little bit. Mr. Karsner, you had talked about emissions being 25 percent less on biofuels, could be up to 52 percent. This is something that I am hearing a lot, that the emissions on biofuels are greater, not less than petroleum fuels. Do you have any idea where this misinformation is coming from?

Mr. KARSNER. Yes, and there are probably multiple sources. Obviously, this is an area of hot interest. So there has been a lot of recent work that has galvanized around it.

Primarily the recent surge in information on the subject matter that we would find questionable comes from two of the reports that were published in Science magazine. They go by Searchinger and Tillman. Even the authors have said that some of this has been taken out of context. We have actually seen it rehashed almost verbatim through multiple outlets. It spread like wildfire.

I am often amazed that very few people know that the President and Congress have worked out a reduction plan for 20 percent of our gasoline, but within a week of this report coming out on assumptions that we would find highly questionable and, in fact, contrary to what is in the law and including the protections that were built into the law, there is sort of an implausible, extreme scenario that then has no sensitivities run alongside of it. So our work at Argonne National Laboratory and across the national laboratory system rapidly went into a validation mode to work with that.

Forgive me for going a little long here, but there was an interesting element that came out, which is the study and need for indirect and direct land use as an element of emissions and off-gassing. That work is also something that has been underway at DOE and across the Government for some time, but it has aroused a new level of debate. It is a matter that should be included in the discussion, but we think across more plausible, realistic assumptions and scenarios.

Senator TESTER. Thank you.

Mr. Pyle, I have just got a few questions about the green crude. What does it cost a barrel now?

Mr. PYLE. Obviously, we are not at full production, but the projected production costs of this will be comparable to that of existing means by which we can get new oil products. So when I am speaking about those, I am speaking about deepwater drilling, oil shale, oil sands. So we are looking in the range of about $50 to $80 a barrel.

Senator TESTER. Good. When you talk about being carbon-neutral, I assume—correct me if I am wrong—that you are taking into account tailpipe emissions also.

Mr. PYLE. Absolutely.

Senator TESTER. Is it done inside, outside? How available is it?

Mr. PYLE. This is done outside. It has a lot of similarities to agriculture in the sense that it is an outdoor kind of crop-like system, but does not use agricultural land or agricultural products.

Senator TESTER. Is the process so unique that—can it be done on a smaller scale I guess is what I am asking. Can it be done on a decentralized basis?

Mr. PYLE. It could be on a decentralized basis, but my business is to do it on a very large scale to provide very large supply to the

existing infrastructure like pipelines and refineries. But there is a potential to do it on a decentralized basis.

Senator TESTER. Mr. Huttner, very quickly. Cellulosic ethanol is something that we have been talking about for a while, and I think that corn ethanol has done its job as far as establishing the market. Cellulosic is a direction we need to go.

You talked about a pilot plant in 2009. When do you really think that this will become a reality where we can talk about cellulosic ethanol the same way we talk about corn ethanol?

Mr. HUTTNER. Our plant will be operational in 2009, but over the course of the next 2 years, there is a number of pilot and demonstration plants funded by the DOE's program that will be coming on line. So I think in 2 to 5 years, you will start seeing commercial volumes.

Senator TESTER. Will it be as cost competitive as green crude or corn ethanol as far as what Senator Corker talked about, that, hopefully, once we get these industries off the ground, we can pull back the support and they can stand alone. Do you see that as the case for cellulosic ethanol?

Mr. HUTTNER. At some point as the market develops, absolutely. That would be the intent.

Senator TESTER. Thank you very much. I appreciate everybody's testimony today. I appreciate the work you are doing, and I just thank you.

Senator DORGAN. Senator Tester, thank you very much.

Dr. Glauber, I note that the former chief economist at USDA, whom I have dealt with for years in various committees, Keith Collins—I noted in the press that he has been hired by Kraft to assist in the Grocery Manufacturers campaign against biofuels. I note that he criticized your analysis of the impacts of biofuels on food prices on behalf of his clients.

Can you explain to me the methodology that you used to evaluate the impacts of biofuels on food costs and how that might differ from the way Dr. Collins and his client would have liked you to have calculated those effects?

Mr. GLAUBER. I have not seen his analysis.

Senator DORGAN. Have you heard of it?

Mr. GLAUBER. I am aware that he has been working with Kraft.

I would say this, that our analysis, what we did—and again, let me be very clear. It depends very much in terms of what timeframe one looks at and what the actual analysis—you know, the experiment, if you will, that you are looking at.

Senator DORGAN. That goes without saying.

Mr. GLAUBER. Yes. No, I know. But I think it is important here.

For example, Dr. von Braun talked about IFPRI's analysis showing a 39 percent impact on corn. I think that when I looked at holding—when we looked at the impact on corn, we held ethanol production constant over 2005 to 2007. Over that period, we increased corn use for ethanol by about 2 billion bushels. By my crude calculations, just as he was talking about it, if you looked at what his analysis did, he assumed ethanol growth rates over the 1990s applied to the current thing. He would be getting very similar—I mean, he gets a higher number, but if I were looking at a compari-

son between, say, 1 billion gallons and 3 billion gallons, I would be getting a higher number as well.

So I do not know exactly what Dr. Collins did. All I know is we held it constant at 2005 and looked at the price effects, translated those price effects into the CPI number, and derived it that way.

Senator DORGAN. You know what? It is no clearer to me now, but that is not necessarily your fault.

Dr. Pyle, I am chairman of the subcommittee on appropriations that funds a lot of these, including Secretary Karsner's operation. I included money for the first time. We stopped research on algae about 15 years ago. Last year, I included money in the fossil fuels account to begin that research again. I am a big fan of algae. I know some look at it and say it is way out in the sweet by and by, and it is kind of fanciful in any event. But it just makes sense to me to find ways to use algae.

Now, when you talked about what you are doing, are you producing algae in greenhouses? Are you producing it in vessels? Tell me how you produce the algae?

Mr. PYLE. So the overall process is a multi-stage process, but the largest component of it is kind of an outdoor pond, for lack of a better word.

Senator DORGAN. You could use the CO_2 effluent from a plant. Right?

Mr. PYLE. That is correct. Coal-fired flue gases.

Senator DORGAN. So it is beneficial use of something that we want to get rid of.

Mr. PYLE. Absolutely.

Senator DORGAN. You produce the algae. The algae increases in bulk in hours. It is an unbelievable product. It grows in waste water, single-cell pond scum. It needs water and CO_2. We want to get rid of CO_2. We grow algae. You harvest the algae for your green oil or some harvest it for diesel. I mean, there are various approaches.

This just makes a lot of sense to me. The reason I mention this to you is I think in many ways if we look in the rear view mirror 5 years from now, we are going to say, wow, I had no idea this was going to happen.

A couple guys from Texas came to see me, and they are taking off the flue gas—using chemicals to treat the flue gas and they come up with three things, hydrogen, chloride, and baking soda, and the baking soda contains the CO_2. Then they landfill the baking soda. Is that not interesting? They have got two projects, demonstration projects. The question is, do you take this to commercial scale? I do not know the answer to that.

But I think there are a lot of things happening that are interesting, and I think one of them is especially the use of algae.

So tell me where are you in the process. You are in a demonstration process?

Mr. PYLE. Yes, sir. We are moving right now to our demonstration facility. We have a number of operations mainly in San Diego, New Mexico, and Oklahoma. There are a number of excellent places in the world and in the United States to deploy this kind of technology. In the United States, it is primarily in the southern States and ideally in New Mexico.

Senator DORGAN. One quick question of Mr. Karsner. I wanted to ask all of you questions, but we are limited in time. Mr. Karsner, you and I visited NREL out in Golden, Colorado, and they showed us what they were doing with respect to cellulosic ethanol. There are others who tell me that the private sector is way ahead of NREL. I do not know if that is true or not.

Give me your assessment of where we might get to cellulosic in a commercial scale in any reasonable timeframe.

Mr. KARSNER. First of all, let me say I hope it is true. You know, first past the post. It should not be that the Government has to be exclusively the leader. We can be the leader by catalyzing commercial feedback loops. We can find out that we are not doing enough in algae and open up our program with enough agility to begin including those things and catalyzing more private sector capital. We are doing that at NREL and at Sandia now, opening them up to work with Chevron and others on algae.

But we think that our original metric was to get commercial scale process integration by 2012. We actually think, now that we have a couple projects that we have measurably stage-gated and some of them that have already achieved financing and groundbreaking, that it is likely, as you heard earlier, that some of these might achieve commercial openings by 2010 or 2011. Again, they will be reacting to the price signal. Our 2012 metric was established when we were estimating gasoline based on an EIA baseline of $30 to $35 per barrel. So the price signals are going to affect our urgency and it is going to affect the amount of money coming in if we have policy predictability.

Senator DORGAN. Thank you very much.

Senator Bingaman, let me thank you for putting together a really terrific panel. I thought that you contributed a lot to this discussion. I appreciate the work that all of you have done.

Senator Barrasso.

Senator BARRASSO. Thank you very much, Mr. Chairman. Thank you for putting together this panel.

Dr. Outlaw, if I could visit with you. The chairman asked earlier one of the other witnesses about the tough year on crops in the Midwest, the impact on corn, and the specifics of the waiver authority with the EPA. From where you are sitting in Texas, could you add a little bit to what your thoughts are on the best way to accomplish these things and where we ought to be going now?

Mr. OUTLAW. Clearly, our Governor asked for the waiver. He did not ask for the particular research that I reported on today.

But the question becomes what are you trying to achieve. If you are trying to achieve a slowdown in ethanol production which would eventually relate to lower farm prices, our research would suggest that this is a very slow way to get to that answer because, as most of us said, we do not believe that the RFS is going to be binding. So if you relax the RFS, you just relax something that was not really the driving force anyway.

Taking it a second step, I would like to make sure you know that we do not have any idea what the investment community is going to do if that waiver is reduced. I suspect that they would have second thoughts about putting a lot of money in something that was not going to be supported. But again, I do not know that for a fact.

Senator BARRASSO. Thank you.

For any member of the panel or several that may want to comment, wholesale ethanol right now is about $1 cheaper than wholesale gasoline. So this could indicate that now ethanol is an established substitute in the fuel market. If this is, indeed, the case, why is continued support, be it Government protected demand or a Government subsidy, justified at this point?

Mr. KARSNER. Let me say it is not fully established in the market because the price metric you just spoke to, Senator, is a temporary blip in time. The price signals are dynamic and constantly moving in time. So at times that ethanol price is on the floor and cannot support debt payoffs and servicing of the facilities that we install, let alone the much higher capital cost facilities that we seek to install for cellulosic biorefineries, and at times, ethanol price is high. Sometimes it is high; sometimes it is low.

Now because it is low, it is constraining the price that we pay at the pumps. We would be paying 20 to 35 cents more per gallon were ethanol not being pumped out in the volumes it is now, displacing 7.2 billion gallons of gasoline in this country, a million barrels per day of production, 17 million metric tons of greenhouse gas emissions, let alone the amount of money we are exporting abroad. So it is providing an enormous service that we need to get to the definition you are talking about and establish a place where it can stand on its own. It can only do that when the market becomes defined.

Right now we have defined production with a mandate. We have not defined the market that it gets delivered into, and until we get intermediate blends in place that allow ethanol to rise to E10 and up above it, then you will have an established market. Until then, it is just a production mandate with an incentive to build.

Senator BARRASSO. Anyone else want to comment on that? I do not see any takers on it. Yes, sir?

Mr. GLAUBER. I will weigh in.

I do think that if you look at the studies that have been done—and there have been several studies over the last couple of years. I would be happy to provide a summary of some of them for you. But the ones that look at elimination of the blender tax credit show substantial drop-off in fuel production. There is no question about that. Now, most of these also assume the assumptions on oil prices are considerably lower than the current prices. I think, again, there is no question that at $130 oil you can make money without the blender credit. But most of the studies, again, are focusing—I would say offhand that probably the average oil price considered is in the $60 to $70 range in their baseline assumptions—would suggest that there be a fairly large drop-off in production.

Senator BARRASSO. Dr. Pyle, there is a front-page article, business section of the New York Times today, Commodity Prices Show No Let-Up. We talk about not just the pain at the pump, but clearly the pain for people who are doing their grocery shopping. I see it in Wyoming every weekend when I am home.

I have cosponsored legislation with Senator Hutchison from Texas that would limit just the proportion of ethanol mandate derived from corn to 9 billion gallons a year. What would the impact of this legislation have on the ethanol industry today?

Mr. PYLE. Kind of following what Secretary Karsner and something that Dr. Outlaw said that we have to be very careful about here is this is not an established industry. The biofuels industry is not established. It is very nascent in investors' minds. People are very worried about the future of it. From where I sit, even though I provide a fuel product which is, as I said, does not use agricultural land nor agricultural products, I am very concerned about investors' appetite and investors' perception of the future of biofuels in this country.

So kind of following, I agree with Secretary Karsner. It is the wrong thing to do to send a signal at this point that jeopardizes that future in investors' minds because what we really want to do is transition to a market economy that provides biofuels and substitute renewable fuels competitively with oil. We are not there yet.

Senator BARRASSO. Mr. Chairman, my time has expired. If I could have a statement put in the record, I would appreciate that.

The CHAIRMAN [presiding]. We are glad to include that in the record.

[The prepared statement of Senator Barrasso follows:]

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

Mr. Chairman and Ranking Member, thank you for holding this hearing today.

I think it is important that Congress explore and address unintended consequences from adopted legislation in all arenas.

The topic of today's discussion—renewable fuels effect on food prices—is timely and very important to my constituents.

I am aware of the lingering questions that have been raised about the impact of our biofuels policy on our water supplies, our land use, and grain inflation.

Corn prices are on the rise.

This is due to:

- Rising transportation and fertilizer costs;
- World growth; and
- Many argue that increased ethanol production mandated by Congress has contributed to today's higher prices.

A quick review of some congressional incentives to promote biofuels is include:

- the volumetric ethanol tax credit, now at 45 cents per gallon;
- the biodiesel tax credit, o the small agri-biodiesel producer credit,
- a host of guaranteed loans which could be used for biofuels,
- a range of grants through both the Department of Energy and Department of Agriculture,
- biomass research and development initiative, and
- a protective ethanol tariff; and
- of course, the renewable fuels mandate.

These policies are not without cost:

- To the taxpayers and
- To buyers of corn, especially the nation's livestock producers.

I believe that it is of utmost importance for our nation to develop all sources of energy available to us.

We need biofuels, wind, solar, coal, gas and nuclear—we need it all!

However, our policies should not provide extraordinary advantage for any one source.

We should carefully consider any ramifications of the selected policies.

There is no doubt the combination of federal policies has more than spurred increased investment in corn-based ethanol.

But, government policies to promote any one source of energy move us away from market efficiency.

The renewable fuels standard expanded and extended by Congress in 2007 is affecting the grain markets today.

There is dispute over the magnitude of the impact, but the inflationary effects are clear.

This nation has developed the market demand and infrastructure for the ethanol industry to take off and prosper.

The combination of mandates, subsidies and tariffs are:

- resulting in market inefficiencies;
- frustrating other agriculture and food industries; and
- contributing to inflationary pressures on American families.

We need to take a hard look at energy policy in this country.

I hope we can focus on ways to reform these unintended consequences and do what's best for all American people.

Thank you very much, Mr. Chairman.

The CHAIRMAN. Next, Senator Craig.

Senator CRAIG. Mr. Chairman, thank you.

To all of you, thank you. I have found all of your testimonies interesting, and of course, to those of us who spent a near lifetime here focused on energy and the dynamics of the new markets that are out there and the potentials, what you say is very exciting.

I am pleased to hear that you speak about stability because we are not necessarily a stable crowd around here when the politics of push get to us. The politics of push are on us right now, whether it is from the food supply side or the $4.50 gas at the pump. We tend to sometimes mix things up in the wrong way. I have oftentimes thought that as we advance or assist in the advancement of technology, we ought to be looking at the market and saying where is the breakeven point. Where do we floor this and protect it so that it does not get denied by some movement in the market or by a valve being turned over in the Middle East to affect the market and shut down a technology if in fact we are to become more independent? So I appreciate your thoughts on that.

Secretary Karsner, you have, in part, answered a question. I think you were referring to it in passing a few moments ago, or I should not say in passing. It was a pretty clear statement. But EIA does say that absent ethanol in the market today and in the blends, the price at the pump is 25 to 30 cents per gallon higher. Is that not correct?

Mr. KARSNER. Twenty to 35 cents. That is the DOE's estimate which is, by most measures, conservative.

Senator CRAIG. Yes. Therefore, as a multiplier, we do not take that gross value on a daily basis and put it against the rising cost of food because usually that person who is acquiring food is also acquiring energy.

Mr. KARSNER. Absolutely. It clearly compensates, and there is a net offset there. So if you are talking about a 3 to 4 percent rise in food prices or protecting the strategic supply of Doritos, if you will, when you talk about the larger geopolitical questions of energy security, environmental, and how it affects our pocketbooks at home, it dwarfs it relative to the absolute savings.

Senator CRAIG. Yes. I think we need to put up a few billboards on that one because there is a crowd out there who does not like corn-based ethanol to begin with and their shout is pretty loud at the moment.

Dr. Pyle, your discussion about RFS has been fascinating. We never do anything around here quite the way it ought to be done sometimes. There were some tradeoffs made there. RFS got a little

bit of political correctness adjusted to it in the course of compromise. The chairman might disagree with me a little bit or agree to some extent and then add more to it. Sometimes when we get into conferences between the House and the Senate—frankly, we had a much better version, and if it were the version that we had, you might not be—your testimony would be different today than it is because I think we ought to be out there in this definition accommodating a much broader base of technologies and not trying to be the market, but let the market be the market. But we get caught up in that.

I thank you for making that clear. Do not be quiet about it.

Mr. PYLE. Thank you, Senator.

Senator CRAIG. Stay with it and maybe we will make those kinds of adjustments because we all know energy has become a very dynamic issue in this country, and therefore, it is going to cause us to make changes and adjustments over time. Hopefully sooner rather than later.

Secretary Karsner, does the U.S. have enough biomass resource to meet its Energy Independence and Security Act mandate without competing excessively with food usage?

Mr. KARSNER. Senator, as you know, we together with USDA and six of the best DOE and USDA scientists across laboratories like yours at INL, NREL, Oak Ridge, Nebraska, Tennessee, all worked to produce the Billion Ton Study in 2005, which was peer-reviewed. I am pleased to validate and affirm that. We even put a display out in the hallway so that people would understand where we are going with that. It was very conservative in all the assumptions undertaken in that study, which I could cite to separately and would be pleased to submit for the record.

[The information referred to follows:]

"Biomass as Feedstock for a Bioenergy and Bioproducts Industry: The Technical Feasibility of a Billion-Ton Annual Supply," a report jointly sponsored by the Departments of Energy and Agriculture, was published in April 2005 and is available on DOE's website at http://www1.eere.energy.gov/biomass/pdfs/final__billionton__vision__report2.pdf.

But you should know that Oak Ridge is planning very shortly to release an update that would show an even greater yield. We estimated at 30 percent by 2030 was possible, conservatively discounting and excluding all the conservation resource land, but we think with even more data that we have had in the 3 years since, that the updated Billion Ton Study will validate that we are exceedingly plentiful in our capacity to have nonedible food sources for biomass cellulosic.

Senator CRAIG. Thank you for that work, and I will keep asking that question as long as I am here so that my colleagues will listen to it a little more.

I ran into a dairy farmer in Pennsylvania recently who put 100 acres into switchgrass to create a hunting preserve for upland game birds. I thought it fascinating that the types of switchgrass that do meet what we are after in cellulosic he found had a rigidity so they withstood the first snowfall so they did not come down so you could hunt through them. But once the hunting season was over, you could cut them and take them off, if you will, to—I said brewery. It is a distillery actually—for the purpose of cellulosic. Of

course, next year they returned with the value of the hunting preserve. He was focusing on it in a very fascinating way, and I said, well, then you need to be more clear with our conservation friends. Maybe they would buy that if we first use it to protect birds and second to run cars.

But there are some dynamics out there that are reflected by many of you today that really do fit, and I hope that we let the marketplace work by opening up to it wide open and letting it decide who the winners and losers are going to be in this business of energy while not trying to get too politically correct around here.

Thank you all much.

The CHAIRMAN. Thank you very much.

Senator Menendez.

Senator MENENDEZ. Thank you, Mr. Chairman. Let me thank the witnesses for their testimonies.

Secretary Karsner, let me ask you. I think Senator Tester may have plowed some of this ground, but I would like to visit it again.

When we look more broadly about the environmental impacts of the Renewable Fuels Standard, some scientific studies have argued that converting grassland to grow corn results in a spike in greenhouse gas emissions because of fertilizer use and other factors. In addition, using acres to grow fuel here can encourage growing more food crops in places like Brazil, putting pressure on deforestation rates.

Is producing over 8 billion gallons of ethanol a year under the RFS actually reducing greenhouse gas emissions, or when we follow the impacts all the way through, does it exacerbate global warming?

Mr. KARSNER. According to our studies, it is a net reduction.

With respect to the indirect land use question and the valid questions that you are asking with respect to sustainability up and down the food chain and how it affects wells to wheels analysis, I should note that this committee put into the legislation demands that we actually perform those studies ahead of some of the reports that had come out in the community. So that was well thought through in the Energy Independence and Security Act, specifically section 232, and those studies are underway.

Senator MENENDEZ. Have you done those studies? You have not done those studies yet.

Mr. KARSNER. We are performing them now.

Senator MENENDEZ. You are performing them now. So the testimony that you have given to the committee does not include an analysis of those studies obviously because you are performing them.

Mr. KARSNER. We have detailed analysis of the studies that were performed that are bringing these into question that I think you are alluding to, the Searchinger study. We have published our analysis of those studies online in great detail on the front of our Web page and have spoken to what we think of the validity of the assumptions.

Senator MENENDEZ. But you are doing your own independent studies.

Mr. KARSNER. The Department, yes, has commissioned the studies——

Senator MENENDEZ. What I am saying is the testimony that you gave before the committee today obviously does not have the results of those studies yet, the ones that you are performing.

Mr. KARSNER. The studies that are underway we have not included the conclusions of in our testimony. That is correct.

Senator MENENDEZ. All right.

So let me ask you, Dr. von Braun. I heard your testimony and I also read it. Your testimony states that biofuel production accounts for 30 percent of the recent increase in commodity prices. World Bank economists have blamed that same cause as 65 percent of the rise. Yet, Dr. Glauber said it is only 3 percent of the price rise. How do we explain the differences? Are we all comparing the same items, or are we having very fundamentally different calculations? Because that is a pretty wide swing.

Mr. VON BRAUN. Senator, we have different models and different assumptions. Let me refer to the international global model. You need a global model which has all commodities, all countries in there, and political reactions taken by countries. The IFPRI model called IMPACT is a well tested model device in 15 years. It has predicted earlier the change in the world food markets 3 years ago. So that is where the widely trusted price effects are coming from, a simulation which is running the model with past trends versus the increased expansion of biofuels from both grains and oilseeds over the past 7 years.

We also look into the future. Some of the World Bank studies are, as far as I understand, also future oriented. Our analysis for the next 10 years suggests that if the current plans are further implemented around the world, not just in the U.S., we could expect another about 15 to 20 percent real price increase. If you double those, it would be for corn an increase closer to—more than twice of that, about 50 percent.

Senator MENENDEZ. In what little time I have left, is there one or two significant factors? You said there are different parts of the equation that everybody is looking at. What is the different part of the equation between the world one that you just described and the U.S. one? You said you are working under different assumptions and different parts of an equation and that the world one that you just defined that has existed for 15 years or so is different than the one that I assume Dr. Glauber who just told us earlier that 3 percent is the rise in world food prices as a result of biofuels. What are the one or two different elements that the world one includes that we do not include?

Dr. VON BRAUN. Our model is one which is a long-run scenario model which factors in all policies and all investments. We have run our scenarios for the long run which I think is essential because you need to factor in the supply and demand.

I understand the USDA scenarios are looking at last year's or 2-year price effects, and that may not capture the final adjustments. But I think it would be fair to ask the colleagues from there to comment.

Mr. KARSNER. Senator, if I may. The obvious difference is inputs, what are the commodity inputs, and outputs, what are the products going to. Here in the United States, we are almost exclusively going to alcohols derived from corn. I am not an economist, but the

capacity for that corn to affect the rice price in Asia is obviously disconnected. You can batch them together for global meta-modeling purposes, but the subject of the hearing on how are renewable fuels in the United States affecting commodity prices is really focusing on actual, real-time empirical data of what are our corn plantings doing, what is the yield growth, what are the inputs, and then where are they going.

In Europe, there is far greater use of biodiesel derived from wheat straw by way of example. So it is going to affect wheat prices. Palm oil used in Europe from Southeast Asia. These are things we do not particularly have a strong presence of in the United States. We are really about corn supply, for better or for worse, going into alcohols as opposed to biodiesel from the myriad sources being imported in Europe and in other demand economies.

Senator MENENDEZ. Thank you.

The CHAIRMAN. Senator Murkowski.

Senator MURKOWSKI. Thank you, Mr. Chairman, and thank you to the panel for your comments here this afternoon.

I am not quite sure what I go home and tell my constituents because right now we are facing the highest energy prices in the Nation. The spring barges have just come in and some of our villages and some of our regional hubs. I was just out in Dillingham, a fishing community out in Bristol Bay, pretty sizable by our standards, and they are paying $5.50 for gas right now. Diesel is about $6.50. But they are paying 8 bucks for a gallon of milk, 10 bucks for a carton of orange juice. We are used to paying high prices for our food because our transportation costs are what they are, and we deal with that. But we can only deal with it to a certain point because right now the fishing boats are not able to go out and leave the dock and fuel up.

So as they are looking at their energy costs growing and now they are looking at their food costs going through the roof, they are like every other American out there. They are saying, Lisa, what are you doing about it? What are you doing about the high energy costs? If they think that the price of their food, a carton of eggs or milk—actually we do not get milk in a lot of our villages out there because it goes bad. But if they think that the price of food is tied to the fact that we are using it for fuels and we are not seeing any relief for fuels, it is a tough explanation to folks out there.

So I am not sure what I am going to tell them. I will make sure that I read again the comments from not only you folks that have provided us your input to really try to understand what is going on as we talk about the RFS.

Let me ask you, Secretary Karsner. I think most of us believe that the real benefit from biofuels is going to be when we take that transition from the corn-based ethanol to the cellulosic. Given last year's legislation and the increase in biofuels required, if we were to slow that for ethanol, what kind of a ripple effect would that have, if any, on the progress toward cellulosic?

Mr. KARSNER. In terms of private sector capital formation, Senator, I believe it would be devastating to have an erratic switch turn in policy predictability. This was the first time we had come out with a policy that goes beyond aspirations for displacing oil with new technology and fuel sources. So all of the capital that has

galvanized is waiting with bated breath to see whether Washington will affirm that policy for the long term so that these multiyear investment plans can be lived out that some of these companies are dependent on. So while the Department of Agriculture stated in real time a net production installed capacity may not alter dramatically in terms of the new installed capacity for cellulosic sources, I think you would see capital dry up to a trickle.

Senator MURKOWSKI. Let me ask you to answer that, Mr. Huttner. You spoke to the promise of cellulosic in your testimony here. Do you agree?

Mr. HUTTNER. No, absolutely. I think the impact, if there was a change in the Renewable Fuels Standard, it would have a ripple effect certainly on our company's decision to invest capital and the technology investment that is going to be required to achieve the breakthroughs we need in the economics of the conversion process. If there is no Renewable Fuels Standard that we can predict is going to be there for the market, we are going to depend on a development of a global traded commodity of ethanol which I think is a long ways in the future.

So the policy framework and the ability to predict what that is going to be is very important to making investment decisions today because it will take 2 years or more for us to bring the full technology package to market, and we would not be doing that if there was a doubt about the Renewable Fuels Standard.

Senator MURKOWSKI. Let me ask a question about the price of gas. There is some implication, I guess, that perhaps motorists are showing a reluctance to use the ethanol additive fuels simply because of the lower gas mileage than the fuels without ethanol. I had seen a GAO report earlier this month that seemed to predict that the fuel costs will be higher because of the RFS.

Secretary Karsner, what is your view as to the cost impacts to motor fuel as a result of the renewable fuels?

Mr. KARSNER. So we actually have two regulated products available to consumers today, E10 on the blend side and E85. E85 has a noticeable penalty in terms of the efficiency of the use of the fuel, but as long as the pricing—that is, the price per Btu—is commensurate, then you suffer no loss on a per-gallon basis.

It is very much the same with the E10 blend, but you have to remember that 10 percent, which is more than 99 percent of all of the ethanol in the market, is actually displacing oxygenates. So it is something that the oil companies and blenders have favored themselves, and importantly, it is allowing them to be in compliance with the Clean Air Act, without which we begin to get into toxins like toluene, xylene, benzene that begin to affect our air quality. So ethanol is actually doing something for compliance in addition to the economics.

But as I stated, the economic data at the Department of Energy, 35 cents savings per gallon today, more than compensates for any minor incremental loss from using the blend.

Senator MURKOWSKI. Do you think that that is being communicated to the consumer, though?

Mr. KARSNER. No. I think the consumer is subject to an overwhelming amount of misinformation today on this.

Senator MURKOWSKI. How do we correct that misinformation?

Mr. KARSNER. I think this hearing will go a long way, Senator. I think your leadership in bringing out the facts. We cannot compete with the budgets of those who would like to misinform. I was asked a question about the source of the misinformation. The more important question is the pace of misinformation. This seems to be highest whenever commodity prices and price spikes on oil are highest.

We have to keep our eyes on the prize and not get distracted. We have got to erode the addiction and blending, stepping up that incremental blending to E10 and E15 at a time that it is lowering the price—I mean, Alaskans get hit hardest when Americans get hit hard. So the difference of an extra 50 cents if we were not blending it would be enormous. So we have got to get that message out.

Senator MURKOWSKI. Thank you, Mr. Chairman.

The CHAIRMAN. Thank you.

Senator Wyden.

Senator WYDEN. Thank you, Mr. Chairman. I think it has been an excellent panel and you are testifying at a key time.

I have a couple of questions for you, if I might, Secretary Karsner, and then you, Dr. Glauber.

It seems to me that the Renewable Fuels Standard, as it is written today, just defies common sense and, in many respects, is just totally arbitrary. I want to dig into one very specific area.

Obviously, when our country is so concerned about these skyrocketing food prices, we ought to be using as much cellulosic material as we possibly can for biofuels. But you really cannot do that because anything grown on Federal land is out for the purpose of defining biomass and the Renewable Fuels Standard. So in my part of the world where people are just hungry to use wood waste, for example, for satisfying the biomass definition—I know that there is great interest in agricultural communities about various kinds of straw, wheat straw and others—there would be an opportunity for us to get this cellulosic material, take steps that would be good for our natural resources, good for our economy, and would hold down food prices if the country goes back and looks at this Renewable Fuels Standard, particularly as it relates to these areas I am talking about, anew.

So my question for you, Dr. Karsner, does it make sense to you to categorically exclude biomass from Federal lands?

Mr. KARSNER. No, it does not. Absolutely it does not. I do not know how that happened. I think it was something on the trimming room floor at the time that the bill was getting into its final——

Senator WYDEN. I will tell you exactly how it happened. What happened was Chairman Bingaman and Senator Domenici, to their credit, when we were debating this in our committee, allowed us to go off and bring together people from the agriculture production side and forestry and environmental folks, and we got the right definition of biomass so that we could get this material from Federal lands, cellulosic material. Then it went over to the House of Representatives and ended up in the trash can. So we are going to try and——

Mr. KARSNER. I do not want to touch that one, sir.

[Laughter.]

Senator WYDEN. You can handle it just that way.

Mr. KARSNER. I would, if I may, Senator, say it is the very first project that has broken ground in Soperton, Georgia that has relied on forestry products, It estimated in its original economics, one that we are funding with taxpayer cost share, a 20- to 50-mile radius where it could access Federal lands. Under that provision, it now has to aggregate these and introduce new logistics of 100 to 200 miles to import, to go around the Federal lands where they originally sited. So there is not a good, rational reason why we should exclude woody biomass from Federal lands that we are aware of.

Senator WYDEN. The same question for you, Dr. Glauber. Does it make any sense to exclude biomass?

Mr. GLAUBER. No, I do not believe it does. I would agree. I know the Administration in its own farm bill proposals oriented some on the development of ethanol from forest products. So, yes, it does not make any sense.

Senator WYDEN. We are going to need you two because—we are going to let you spare the House of Representatives for purposes of this afternoon's conversation, but we are going to need you two to help us get back the language championed by Chairman Bingaman and Senator Domenici because it made sense. It was the subject of an extraordinarily long negotiation. I think we got it right. It would provide an opportunity, for example, to be sensitive to old growth trees, which was something of great concern, of legitimate concern in the environmental community. We got it right, and then it disappeared when it went to the House. We have got to get it back, and you all have helped us make the case. So we thank you and we will need you to champion that down the road.

Thank you, Mr. Chairman.

The CHAIRMAN. Thank you.

Senator Lincoln.

Senator LINCOLN. Thank you, Mr. Chairman. I apologize for being late. It has been a crazy day. But we certainly are very appreciative to you and Senator Domenici for bringing the committee together to really discuss our Nation's renewable fuel policy in the context of rising food prices and, without a doubt, something that is on the mind of every one of my constituents at this juncture. Just having spent that week at home after Labor Day—or Memorial Day, I guess—you know, you travel across the State and it is mostly what you hear, particularly when you represent a State like I do with a large, disproportionate share of low income working families who are really getting squeezed.

But we should all be concerned about both of these rising costs in fuel and food. As the Senator from one of those rural States that certainly can make a contribution in terms of renewable fuels and certainly in terms of food, but also a State that, having a lot of low income working families, also gets hit. You mentioned Alaska. We are number 48 in terms of low income. But we want to work hard to figure it out.

I just had a visit in my office today from a sheriff from a county that is tremendous in forest lands, but they are not going to be able to meet their county budget come September with the median

income of less than $14,000. It is tough out there, and when these kind of things get heaped upon them, it makes life extremely difficult.

So I hope that we will work together with this committee and the other committees of jurisdiction to make sure that we are doing everything we can to accelerate and move our Nation forward in terms of renewable fuels lessening our dependence on foreign oil but maintaining a critical food supply, which I know we are certainly capable of. We worked hard on the farm bill and were able to secure new tax incentives and other things in renewable fuels areas, but also to maintain the integrity of a safety net. That was important.

I know most of my questions have probably already been asked and I will not be redundant, nor will I keep the chairman here much longer.

But I just had one quick question. If it has been asked, I apologize. As I said before, I do believe strongly that we can balance a biofuels industry and policy with other critical economic interests. I think we have to look at the practical ways to do that.

But I do think the circumstances we are in right now present us all great concern. Livestock, poultry, and dairy producers in my State are already feeling a tremendous impact of higher grain prices, and it could lead to constrictions in those industries. It is inevitable that higher feed costs will ultimately be passed on to the consumers on staples like chicken and pork and beef. We have got great concerns over that.

We have set ambitious goals for renewable fuels, but I also think that Congress was right to provide flexibility in temporarily being able to adjust some of those goals as conditions warrant.

I guess one of the questions mostly for—is it Dr. Glauber with USDA? When is the right time to make adjustments so that other industries and consumers are not unduly damaged? I think that is a question that we have to answer not just today but over time. Maybe you can elaborate—and I apologize again if you have already done it—what USDA's view of the waiver authorities in the 2005 and 2007 energy bill is and at what point would USDA support adjusting mandates on a temporary basis to ease the cost pressures and mitigate some of those unintended consequences.

The other thing would be does USDA have a contingency plan for dairy, livestock, poultry operations, should the feed crisis become even worse. We obviously know that you all made a projection that the corn harvest is going to be 10 percent less than it was last year, and that could pose us some serious problem. It is not good news for that much, the livestock and poultry industry.

I do not know. Due to heavy winters and wet weather that we have had, we have had wheat crops under water for weeks and weeks and weeks and a slowness in getting into the fields and planting our crops. There are predictions that it will be as low as the late 1980s if that becomes another issue.

What do you feel like is the authority at USDA that you have and are there any, again, contingency plans for what we look for down the road?

Mr. GLAUBER. Most of the things you are talking about are real short-run issues.

Senator LINCOLN. Right.

Mr. GLAUBER. I mean, here we are in the middle of a crop year that is still unfolding and admittedly, as I went into a little earlier, certainly USDA has already taken down its projected corn yield. We will know more in August when we have firm numbers from our objective yield surveys. We have an acreage report that comes out at the end of this month. That will be closely watched because want to know. You know, all we have right now to go on is what people told us they wanted to plant back at the beginning of March. So we know there are reports of land that is still under water, the late plantings, and so all that again will get reflected. We will know a lot more in a month.

Senator LINCOLN. Not to mention the weather during the growing time.

Mr. GLAUBER. No. That is right. We are not even into the summer——

Senator LINCOLN. We do not know if there are going to be droughts or a wet summer.

Mr. GLAUBER [continuing]. So all that will be closely watched.

What makes it so critical is the fact that we have very, very low stocks. So the volatility is there in the market. We have seen the price increases within the last week alone, a dramatic price increase for corn.

As I mentioned earlier, USDA, of course, is involved with the waiver request. We are consulted, as well as DOE is, in that.

I also said earlier that I did not believe that the mandate would be binding this year. That is, we will probably be producing more ethanol than the 9 billion gallons that are called for in the Renewable Fuels Standard. Again, that is predicated on a reasonable corn crop this year. But I do not think that it will be binding, and I think Dr. Outlaw here also had a similar conclusion.

In terms of short-run effects, I think one thing that USDA has done is allowed haying and grazing on CRP land, again after the nesting season is over I think in the southern portions of the State. That will begin somewhere on the order of July 1st or so. Then from that period through I think about November 10 or 11 or so farmers who have CRP land will be able to allow grazing on that or haying on that for a nominal fee per contract. That could provide some relief to livestock producers, obviously, who might have an opportunity to graze or——

Senator LINCOLN. So that is your contingency plan?

Mr. GLAUBER. Frankly, Senator, in the short run there is not a lot one can do. One watches this crop and harvests it.

Senator LINCOLN. I am wondering if USDA is having conversations about what would be a contingency plan.

Mr. GLAUBER. No, we certainly are. We are looking at longer-run issues, but in terms of the short run, all I am saying is there is very little one can do. You cannot make rain or you cannot make it dry up.

Senator LINCOLN. I am a farmer's daughter. I can guarantee you I know that.

[Laughter.]

Senator LINCOLN. But I also know you still have to think about the month ahead because——

Mr. GLAUBER. Yes. No, I understand, and I think——

Senator LINCOLN [continuing]. You still have got to make payroll.

Mr. GLAUBER [continuing]. That the Secretary was keen on getting an announcement out on CRP early so that farmers and ranchers would be able to take advantage of that.

Senator LINCOLN. Dr. Outlaw, just so I can make sure I understood your testimony, you had mentioned or you stated in your study that you detected no statistically significant effect of corn on retail meat prices to date.

Mr. OUTLAW. To date.

Senator LINCOLN. But you are saying that is short-term evidence.

Mr. OUTLAW. For sure. We expect, with the research we have done on feeding margins and the cost of gain, there is no way that the animal feeding industries are going to sustain these losses much longer.

Senator LINCOLN. I will guarantee it.

Mr. OUTLAW. So there are going to be changes. They are coming and they are going to be significant. We cannot say that we have found them yet.

Senator LINCOLN. Right. So you are just predicting that everything staying constant, that is what is going to happen is a decline in meat supplies.

Mr. OUTLAW. Right.

Senator LINCOLN. So I hope that we do not just predict it but that we try to work toward preventing that crisis, knowing that we cannot predict rain and we cannot predict weather circumstances, but there are contingency plans to figure out how we are going to be able to support those industries because it is not just our country. We provide the safest, most abundant, and affordable supply of food and fiber for the world. So I think it is a critical issue.

Thank you, Mr. Chairman. You have been extremely patient.

The CHAIRMAN. Thank you for your good questions.

Let me ask a couple of questions before we conclude the hearing here.

There seem to be a lot of variables in this equation as we are talking about this RFS. Although there are significant problems with the final version of the RFS that we passed and we need to try to address those, identify how to do that in a way that is acceptable, one good thing about the RFS, as I understand it, is that although we have a mandate for how much biofuel is to be blended each year, we do not have a mandate for how much of it is to come from corn. I mean, there is a maximum that can come from corn, but there is not a requirement that anything comes from corn. So it is very possible that instead of us getting to 15 billion gallons of renewable fuels from corn being blended by 2015, I believe it is, instead of doing that, we would wind up meeting the mandate from other sources. At least that is theoretically possible.

I wondered, Dr. Glauber or Secretary Karsner or Dr. Outlaw, any of you, have you tried to look ahead and make a calculation or a prediction as to how much of the RFS you expect to actually come from corn as we move through these years of mandate that we have described here, anything that you have predicted with regard to future corn prices?

Another question, which is pretty obvious I guess. I saw a report out of the Department of Agriculture a week or two ago about the percentage of the corn crop that was going to produce ethanol. I think there was something about it being 25 percent last year and now it is going to be 30-plus percent. Do you have a prediction as to where that is going? I mean, are we talking about over half of our corn crop going to ethanol at some point, or if not, why not?

So let me stop with those questions and see if you have a thought about any of that.

Mr. GLAUBER. Let me just speak to the longer run. I think this is a very important issue.

One is that certainly USDA's forecast, the 10-year projections that we make, and I would say most of the other institutions that do this sort of analysis pretty much expect the capacity in the corn ethanol industry to reach 15 billion and to pretty much stabilize there. We have seen 2 years of very rapid growth from 2005 and 2006 to current levels. We are projecting another year of rapid growth in that capacity building, but that it should level off next year and start leveling off toward the 15 billion. What will determine that, what will drive that is, again, the profitability of producing ethanol out of corn. Right now, again, based on our projections, it looks profitable to produce ethanol from corn.

In regards to prices, I hesitate just in the sense that even when we did our long-term projections, that was based on a lot of material back in November. That was even before the energy bill, of course, was passed. But what our projections showed then—and I would not think that they would change much—is that high prices right now would come down a bit.

The CHAIRMAN. High prices of corn?

Mr. GLAUBER. High prices of corn. I am sorry and that they would begin to moderate some as stocks were rebuilt. Now, clearly, we are in a very tight situation right now. A lot will depend on this year's crop to see how fast those stocks are rebuilt.

Again, assuming yield growth, fairly modest yield growth, over time we should be able to rebuild stocks such that prices fall back into the mid-$3 range. That at least is what our projections show.

In terms of the amount of corn made into ethanol as a percent of the total crop, that in out-years is projected at a third or so of the crop, a third to some 35 percent of the crop. But those are large crops too, far larger than—because of yield growth, because of a substantial number of acres going into corn production, that is a lot of corn, and the amount of corn available for other uses such as feed and exports is also supposed to remain at fairly high levels. So we are not cutting into the amount going to feed, for example.

The CHAIRMAN. Do any of the others have a comment on this?

Mr. KARSNER. I am going to talk more simply and simply say that we will assume that whatever the maximum mandated level is, that corn can and will rise to it.

I think it is very important because of, Senator, your great leadership on what this was all about to focus back on the key question, which is how do we alleviate carbon-based fossil fuels and not be contained in the discussion about how do we perfect the individual ethanol. We cannot get to the advanced biofuels that these companies represent or the advanced cellulosic ethanols that we

are programmed for and investing in as a Nation without going through corn-based and conventional ethanol, which is already yielding pricing merits on a microeconomic basis at the pump, on a macroeconomic basis in alleviating the amount of capital that we send abroad to nations that are sometimes hostile to us and, of course, already to the environment. All that we are talking about in programming technologically are improvements on that.

But the perfect is the enemy of the good. We have got to work on today transportation, logistics, retail outlets, engine optimization, terminaling facilities, et cetera. So we are working on that through blending alternative alcohols or, in the case of diesel, alternative biodiesels so that we can scale those in a way that we can integrate them to displace our oil addiction. That has to be the primary thing, and we cannot get stuck between those who would want to distract us and only compete one form of biofuel against another. We are after the better nonedible sources, but not at the cost of bringing this all to a screeching halt with an erratic reaction to short-term ramifications.

The CHAIRMAN. Dr. Outlaw, did you have a comment?

Mr. OUTLAW. I would just add that when we have been looking at these different technologies, clearly the answer to your question is it depends on the relative costs. If the gentleman to my left can move the cost of production of producing fuels low enough, substantially lower than corn-based ethanol, then they would be the major driver in the market. Right now, I know that there are a lot of things in planning, but I believe their costs are significantly higher than the cost of production with corn-based. But I do know that there are a lot of people that think they can get them lower, significantly lower.

The CHAIRMAN. Dr. von Braun, you had indicated you would like to comment.

Mr. VON BRAUN. I think it is important to keep in mind that the competition between food and fuel does not just work directly, but anything that competes with food, whether you produce biomass or corn or soy for energy use, is the central issue. So the hope that technology, which goes toward biomass production and thereby would resolve the issue, overcome the issue of food-fuel competition, is misleading as long as this biomass is not produced somewhere where it does not compete with food because farmers will go for the highest return.

The second aspect related to this discussion is we have looked with our models in these competitions between food and fuel very carefully and the spill-over effects between the grains, between corn and wheat and corn and rice and so on. These spill-over effects of high prices here, when you take 100 million tons out of food and feed production, for worldwide markets are very large. They are very large. So there can be no doubt that these stipulations of the RFS have impacts on poor people and on hunger. Whether a waiver for cause of hunger should be considered may be as legitimate as considering the biofuel feed market competition, which has been discussed earlier.

The CHAIRMAN. Let me ask you just to clarify for myself. If Dr. Pyle is right and you can produce green crude from essentially—

as I understand it, the feedstock is CO_2. I think that is what you are suggesting to us. It is not biomass. It is CO_2——

Mr. PYLE. That is correct.

The CHAIRMAN [continuing]. That would be used to produced algae or to stimulate the growth of algae which would then become a fuel. Now, that would not directly compete, I would not think. I mean, that would not entice all of the farmers in the country to switch over to production of algae rather than crops.

Dr. VON BRAUN. Senator, these are the opportunities for the future, which require a lot of support, but currently the world uses a lot of grain and oilseeds and biomass which clearly competes with food. So the faster we can move to technologies that do not compete, the better it is.

The CHAIRMAN. Right.

Dr. VON BRAUN. We cannot give a grace period to these technologies because poor people do not have that time.

I think at this point we need a dual strategy, to push and invest in these types of technologies which clearly do not compete, and at the same time, accelerate the investment in agriculture productivity for food crops because the treadmill on both sides is running faster and there has been too little investment in agriculture, crop productivity. The yields have to come up. Then we could bring the world food system back into balance, which currently is not.

The CHAIRMAN. I think that is a very good summary of the situation.

Thank you all very much. I think it has been a useful hearing. We will conclude the hearing at this point.

[Whereupon, at 4:25 p.m., the hearing was adjourned.]

APPENDIXES

APPENDIX I

Responses to Additional Questions

RESPONSES OF ALEXANDER KARSNER TO QUESTIONS FROM SENATOR BINGAMAN

Question 1. Many second-generation biofuel technologies have been proven in the lab and are ready to scale up to commercial production. Securing financing for first-of-its kind commercial production remains a major obstacle from many in this emerging industry. Please update us on the progress with the Department's loan guarantee program, which Congress enacted in 2005 to address exactly this problem.

Answer. The two principal goals of the Title XVII Loan Guarantee Program are to encourage commercial use in the United States of new or significantly improved energy-related technologies and to achieve substantial environmental benefits. Supporting renewable energy technologies such as those that have been developed by the biomass industry is critical to achieving these goals. The final regulations for the Loan Guarantee Program were issued on October 4, 2007 and since then a remarkable amount of work has been accomplished. In addition to the Department inviting sixteen pre-applicants, including six biomass projects, from 143 that responded to the first solicitation in 2006 to submit a full application, the Loan Guarantee Program Office (LGPO) staff has grown from one permanent employee to eleven permanent employees, including investment officers with ten to twenty years of worldwide project financing experience. The LGPO is also in the process of finalizing a credit subsidy model, as required by FCRA, has instituted policies and procedures to initiate the application and due diligence process and is developing accounting and processing systems that will allow the office to monitor and manage the loans for which guarantees are issued over the life of the projects. Regrettably, none of the project sponsors of the six biomass projects invited to submit full loan guarantee applications have yet done so. The LGPO has received its first three applications from the sixteen invitees, with projects involving solar energy, improved efficiency in electricity generation, and electric battery powered cars, and is proceeding with the due diligence necessary to assess the technical and financial soundness of the proposed projects.

Additionally, on April 11, 2008, the Department of Energy submitted an "FY 2008 Implementation Plan" to Congress. The Implementation Plan outlines the Department's plans to issue new loan guarantee solicitations in two stages this summer for up to $38.5 billion for projects that employ advanced technologies that avoid, reduce, or sequester emissions of air pollutants or greenhouse gases. The first stage will be in the areas of energy efficiency, renewable energy and advanced transmission and distribution technologies; nuclear; and 'front-end' nuclear power facility projects, and the second stage will be for advanced fossil ebergy projects. These planned solicitations will mark the second and third rounds of solicitations for the Department's Loan Guarantee Program, which encourages the development of new energy technologies and is an important step in paving the way for clean energy projects.

Question 2. DOE has been very supportive of enzymatic hydrolysis pathways for cellulosic ethanol, awarding grants to companies that plan to use this pathway. Please describe how the Department is supporting other second-generation biofuel technologies.

Answer. DOE plans to continue supporting technological development to spur the cellulosic ethanol industry through all major pathways. DOE has announced investments of up to $592.7 million aimed at reducing the cost of advanced biofuel tech-

nologies through its applied research program. These opportunities included DOE investments in advanced biofuels for four commercial scale pioneer biorefineries and nine biorefineries at a smaller demonstration scale that involve biochemical, thermochemical, and hybrid technologies for the production of cellulosic-based biofuels. These investments also include projects for improved enzymes and fermentative organisms for more efficient biochemical conversion and syngas and pyrolysis projects for reduced thermochemical conversion costs. DOE also recently closed a university solicitation focusing on improving conversion of biomass to advanced biofuels via any conversion route.

DOE will continue to evaluate the potential of a wide range of biofuel technologies (e.g., pyrolysis, gasification, hydrothermal liquefaction, catalysis, and fermentation) as well as a wide range of feedstocks for the production of advanced biofuels beyond cellulosic-based ethanol. Algal derived fuels, biobutanol, Fischer-Tropsch liquids, green diesel, and green gasoline are just a few of the non-ethanol biofuels included in DOE's plans and investments. Advanced, or second generation cellulosic feedstocks such as algae, perennial and annual herbaceous crops, and woody crops are also being developed in partnership with the Sun Grant Initiative[1] and USDA to enable future biorefinery development.

Through its three new DOE Bioenergy Research Centers—led by Oak Ridge National Laboratory, Lawrence Berkeley National Laboratory, and the University of Wisconsin-Madison in partnership with Michigan State University—DOE is providing major support for advanced basic scientific research aimed at achieving the transformational breakthroughs needed to overcome the limitations of current production methods and develop decisively more efficient and cost-effective means of producing cellulosic biofuels on a commercial scale. Together, these three Centers—each of which brings together a multi-disciplinary team of top scientists and researchers—are attacking the problem on multiple fronts, utilizing the powerful new tools of genomics-based system biology to re-engineer both plants and microbes for efficient biofuels production. The Centers are already engaged in promising research, including experiments with a wholly new and potentially far more effective pretreatment method for lignocellulose (plant fiber) and early production of hydrocarbon fuels by both microbial and chemical catalytic means. The latter work could eventually enable the Nation to move beyond cellulosic ethanol, to cellulosic gasoline, cellulosic diesel, and even cellulosic jet fuel.

RESPONSES OF ALEXANDER KARSNER TO QUESTIONS FROM SENATOR DOMENICI

Question 1. What percentage of petroleum consumption is offset by biofuels?

Answer. In 2007, assuming no differences in cost per BTU between gasoline and ethanol, U.S. production of 6.5 billion gallons of ethanol helped to reduce gasoline consumption by approximately 4.3 billion gallons.[2] This amount represents about 2.1 percent of U.S. demand for petroleum liquid fuels[3] in 2007 and roughly 3.1 percent of the Nation's gasoline demand.

Question 3. What would be the short-term and long-term effects of relaxing the RFS mandate?

Answer. DOE does not believe that there would be any short term energy benefits of relaxing the RFS mandate. Further, the removal or reduction of the mandate would likely result in a short term increase in gasoline prices as additional gasoline must backfill the decrease in ethanol availability. The primary reason for this is that high crude oil and gasoline prices provide favorable ethanol blending economics for refiners. Therefore, even with relatively high corn and ethanol prices, refiners find it economically attractive to continue increasing their use of ethanol as a gasoline blending component.

Creating a stable, predictable policy environment for investors, as established by the expanded RFS, is conducive to scaling up biofuels and deploying next generation biofuel technologies. Any efforts to repeal or relax that mandate should be carefully evaluated in terms of progress toward reducing the Nation's dependence on imported oil, and reducing greenhouse gas emissions.

Reducing market uncertainty to the renewable fuels market—such as that established by the RFS—is critical to ensuring growth in all parts of the biofuels supply

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[1] All reports are available through the National Sun Grant web page (www.sungrant.org). The direct link to the regional feedstock partnership reports is http://www.sungrant.org/Feedstock+Partnerships/.

[2] BTU equivalent conversion calculation from ethanol gallons to gasoline gallons = 6.5 billion gallons of ethanol x 2/3 = 4.3 billion gallons of gasoline. 2007 ethanol production numbers are from the Renewable Fuels Association.

[3] Total U.S. Liquid fuels demand equates to 140 Billion Gallons of Gasoline and 67 Billion Gallons of Diesel and Jet Fuel, based on EIA data.

chain, from feedstocks, to biorefineries, to infrastructure, and including pipelines. In both the short and long-term, relaxing of the RFS will undercut private sector investments in new capacity of both conventional and advanced biofuels as well as in research, development, and demonstration necessary to usher in the large scale deployment of cellulosic ethanol and other advanced biofuels.

RESPONSES OF ALEXANDER KARSNER TO QUESTIONS FROM SENATOR DEMINT

Question 1. Mr. Karsner, last year's energy bill requires the Department of Energy to be consulted by EPA when evaluating waiver requests for ethanol mandates. Food prices are complex, but when you burn 25 to 35 percent of a crop—it is a straight forward [sic] concept to understand the severe harm that dairy, livestock and poultry producers are feeling. In your communications with EPA, can we expect you to support or remain neutral on the waiver request that EPA is evaluating on the food-to-fuel mandate?

Answer. The waiver requirements of Section 211(o) of the Clean Air Act requires EPA to consult with the Secretary of Agriculture and the Secretary of Energy in determining if the RFS requirements would severely harm the economy or the environment, or if there is inadequate domestic supply of fuel. The Department of Energy assisted EPA in evaluating the energy supply impacts of the RFS as part of the evaluation of the economic impacts and adequacy of domestic fuel supply. The assessment of the RFS impacts on dairy, livestock, and poultry producers and other agricultural commodities was the responsibility of EPA in consultation with USDA. As described in the Federal Register Notice, signed on Thursday, August 7, 2008, EPA determined that a waiver of the RFS mandate was not appropriate at that time. After weighing all of the evidence before it, EPA determined that the evidence did not support a finding that implementation of the RFS would harm the economy of a State, region, or the United States, because the evidence does not reach the generally high degree of confidence required for issuance of a waiver under Clean Air Act section 211(o). DOE supported EPA's decision on the Texas waiver request.

Question 3. Using current average prices, if the price of E20 ethanol and regular gasoline (without ethanol) were compared based on energy content and not by volume, how much more would E20 cost in comparison?

Answer. DOE is currently evaluating fuel economy effects of varying ethanol and gasoline blends. Preliminary estimates indicate that vehicle fuel economy tracks closely to the energy content of fuels tested, which is consistent with recent similar analysis performed by a major automobile manufacturer.[4] E20 and El0 have approximately 7 and 3.5 percent less energy per gallon respectively, than gasoline without ethanol. Using the average East Coast retail reformulated gasoline (RFG) price of $4.127/gallons[5] for the month of June 2008, and assuming that an E20 gasoline blend was priced the same as an El0 gasoline blend (East Coast RFG) on a volumetric basis, a consumer would pay approximately $0.14/gallon more for E20. This estimate assumes a consumer must purchase 3.5 percent more E20 to travel the same distance as El0.

RESPONSES OF JOSEPH GLAUBER TO QUESTIONS FROM SENATOR BINGAMAN

Question 1. Please explain the relationship between U.S. biofuels policy and the world food crisis. Is the root cause of the food crisis based on the price of agricultural commodities, or the physical supply of those commodities?

Answer. The rise in price of agricultural commodities is due to both an increase in the demand for commodities as well as supply disruptions. Higher incomes and population growth are increasing the demand for agricultural commodities. On the supply-side, drought, dry weather, and flooding have lowered production and reduced stocks; and some countries have imposed export restrictions. In addition, record prices for gasoline and diesel fuel are increasing the costs of producing, transporting, and processing food products.

Biofuels represent an added source of demand for agricultural commodities and therefore contribute to the upward pressure on the price of agricultural commodities. We estimate that in the absence of any growth in biofuel production in the United States over the past year, the International Monetary Fund (IMF) global

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[4] Kevin Cullen GM Powertrain Engineering Compliance & Certification, Presentation, Emissions & Fuel Economy: Ethanol Blends vs. Gasoline, 2008 National Ethanol Conference, February 2008.

[5] Energy Information Administration, Weekly Retail Gasoline and Diesel Prices, (Cents per Gallon, Including Taxes) Form EIA-878, "Motor Gasoline Price Survey" Last Updated 07/28/2008.

food commodity price index would have risen by 40.6 to 42 percent as opposed to 45 percent from April 2007 to April 2008.

Question 2. U.S. agricultural yields have increased dramatically, while yields in developing countries have not improved at all. It seems that something in the international system is broken, when developed countries are producing more than they can consume, while developing countries are becoming ever less able to feed themselves. How has this happened, and what can we do to reverse this trend?

Answer. At the recent United Nations Food and Agriculture Organization High-Level Conference on World Food Security, Secretary Schafer identified several ways to address world food security, including: improving agricultural productivity, alleviating market bottlenecks, and promoting market-based principles. Secretary Schafer called for greater investment in scientists and research institutions, market information, distribution networks, and improved access to rural credit. The IMF has suggested a similar policy approach. The IMF noted that "the most effective response for developing countries is to seize the opportunity and step up efforts to encourage expansion of domestic agricultural production by improving infrastructure, distribution, and storage systems; increasing competition; providing a stable regulatory environment and access to financing; and removing trade barriers. This will increase productivity and food supply (http://www.imf.org/external/np/exr/faq/ffpfaqs.htm)."

Question 3. The link between oil prices and U.S. food aid is troubling, as U.S. food aid is diminished by every uptick in world oil prices. The U.S. is giving less in aid just as people need the aid the most. How can we break this link between oil prices and food aid?

Answer. Higher world oil prices increase the cost of transporting food to people in other countries who face starvation due to crop failure caused by drought, flooding, or other natural disasters. The link between food aid and world oil prices could be partially broken if Congress followed through on the Administration's request to authorize the use of up to 25 percent of food aid funds for the procurement of food from selected developing countries near the site of a food security crisis and abandoned the "hard earmark" for development assistance that was included in the 2008 farm bill.

RESPONSES OF JOSEPH GLAUBER TO QUESTIONS FROM SENATOR DOMENICI

Question 4. In your opinion, is the sharp increase in corn prices due to ethanol production, or are other factors major contributors to the price?

Answer. In my opinion, the sharp increase in corn prices reflects a combination of factors with one of these factors being increased production of corn-based ethanol. Over the period covered by marketing years 2005/06-2007/08, the average price of corn more than doubled. We estimate that over this period, increased production of corn-based ethanol in the United States accounted for about 30 percent of the increase in corn prices. A partial list of other factors also contributing to the sharp increase in corn prices include:

- Higher incomes and population growth are increasing the demand for processed foods and meat in rapidly growing developing countries, such as India and China. These shifts in diets are leading to major changes in international trade. For example, U.S. corn exports are projected to reach a record of 2.45 billion bushels in 2007/08 despite record high corn prices.
- Drought, dry weather, and flooding have affected grain production in Australia, Canada, Ukraine, European Union, and the United States. These weather events have helped to deplete world grain stocks. The tight stocks situation is leading to increasing concerns that prices could move sharply higher if this year's harvest falls below expectations. These concerns are causing some importers to purchase for future needs, pushing prices higher.
- Many exporting countries have put in place export restrictions in an effort to reduce domestic food price inflation. By reducing supplies available for world commerce, these actions have exacerbated the surge in global commodity prices.
- Record high prices for diesel fuel, gasoline, natural gas, and other forms of energy affect costs throughout the food production and marketing chain. Higher energy prices increase producers' expenditures for fertilizer and fuel, driving up farm production costs and reducing the incentive for farmers to expand production in the face of record high prices. Higher energy prices also increase food processing, marketing, and retailing costs. These higher costs, especially if maintained over a long period, tend to be passed on to consumers in the form of higher retail food prices.

Question 5. In your testimony you mention that the expansion of biofuels production appears to be a relatively modest contributor to food inflation globally and in the U.S. Please explain.

Answer. The Department estimates that the expansion in biofuels production in the United States accounts for a modest portion of the increase in food price inflation in the U.S. and globally. We estimate the IMF global food commodity price index would have increased by 40.6 to 42 percent from April 2007 to April 2008, assuming no expansion in biofuels production, compared with the actual increase of 45 percent. In the U.S., the CPI for all food would have increased by 4.55-4.60 percent during the first four months of 2008, compared with the actual increase of 4.8 percent, assuming no expansion in U.S. biofuel production.

Question 6. How many billion acres of land is used for agricultural cropland? How much of that land is used for the production of feedstocks for biofuels?

Answer. According to the Food and Agriculture Organization (FAO) of the United Nations, there are about 3.5 billion acres of arable land in the world. We estimate that worldwide about 60-65 million acres of cropland are currently used for the production of ethanol and biodiesel feedstocks, or about 1.7 percent of world's arable land is currently used to produce feedstocks for biofuels production.

Question 7. In your opinion, as ethanol use stabilizes, do you see annual increases in corn production outpacing increases in corn use for ethanol? Why or why not?

Answer. We see corn production and corn use in about balance over the next several years. Continued improvements in seed genetics and cropping practices are expected to lead to increases in corn yields per acre and corn production. On the demand side, continued improvement in diets around the world, population growth, and other factors are expected to lead to increases in domestic use and exports.

RESPONSES OF JOSEPH GLAUBER TO QUESTIONS FROM SENATOR MENENDEZ

Question 8. Although I asked Dr. von Braun this question during the hearing, there was not sufficient time for a detailed response, and I wanted to give you both the opportunity to respond in writing. The International Food Policy Research Institute reports that biofuel production accounts for 30% of the recent price increase agricultural commodities. World Bank economists have made similar claims. Yet the testimony of Mr. Glauber, based on USDA calculations, argues that biofuels only explain 3% of the rise in food prices. How do you explain the difference?

Answer. In his testimony, Dr. von Braun stated that "The increased biofuel demand during the period, compared to historical rates of growth, is estimated to account for 30 percent of the increase in weighted average grain prices." Grains account for about 22 percent of the International Monetary Fund (IMF) food price index.

In contrast, we estimate the percentage increase in price of corn from April 2007 to April 2008 would have been 23 percent lower in the absence of any growth in biofuel production in the United States since crop year 2005/06. Based on information from Dr. von Braun's prepared testimony, IFPRI estimated that the increase in biofuel production from 2000 to 2007 accounted for 39 percent of the increase in corn prices. The one difference between the two studies is the time period. While we look at the growth in biofuel production in the United States over the past two years, the IFPRI study looks at the growth in biofuel production in the United States since 2000.

Question 9. Do either or both of your models account for indirect impacts of increased corn production on wheat and soybean plantings?

Answer. Our model provides estimates of the impact of increased corn production on soybean and wheat plantings. We do not know whether the IFPRI analysis took into account the indirect impacts of increased corn production on wheat and soybean plantings.

Question 10. Are different time periods for calculating baselines or for making predictions?

Answer. We analyzed the effects on crop and livestock markets of the growth in the amount of corn used for ethanol production and soybean oil used for biodiesel production during marketing years 2005/06-2007/08. We believe the IFPRI study looks at the growth in biofuel production in the United States since 2000.

Question 11. Do differences between the IMF global food commodity price index and domestic metrics like the Consumer Price Index contribute to differing estimates of the impact of biofuels? Are there real differences between the domestic and international marketplaces which lead to biofuels having a disproportionate impact?

Answer. Differences in the IMF global food commodity price index and domestic metrics like the Consumer Price Index (CPI) for food contribute to the differing estimates of the impact of biofuels. The IMF global food commodity price index is often

quoted as an indicator of the change in global food prices. The IMF global food commodity price index includes a bundle of agricultural commodities, including cereals such as wheat, corn (maize), rice, and barley as well as vegetable oils and protein meals, meat, seafood, sugar, bananas, and oranges.

Alternatively, the CPI for food is based on the prices of food items purchased by consumers at retail establishments. The CPI for food consists of two components—the CPI for food at home with a weight of 55 percent and the CPI for food away home with a weight of 45 percent. The CPI for food at home includes a bundle of finished food products, such as cereals and bakery products, meats, dairy products, and fruits and vegetables, while the CPI for food away from home measures the cost of meals purchased away from home. Because the farm value of agricultural commodities accounts for a relatively small share of retail food costs in the U.S., changes in farm commodity prices contribute to substantially larger increases in the IMF food commodity price index than the CPI for food. For example, while the IMF food commodity price index increased by 45 percent from April 2007 to April 2008, the CPI for food in the United States increased by only 5 percent over the same time period.

The impacts of higher commodity prices on consumers vary from country to country depending on diet and the proportion of staples versus highly processed food consumed. It is unclear how the list of commodities and the prices used in the IMF index relate to the foods purchased and the prices paid for food items by consumers in less developed countries.

RESPONSES OF JOSEPH GLAUBER TO QUESTIONS FROM SENATOR DEMINT

Question 12. USDA's recent crop report indicate that producers intend to plant about the same amount of acres as in years past and about 7 percent less corn. Yet, prices for these crops are at substantially higher levels. What explains this mismatch between the higher prices and static production and less production for corn?

Answer. In 2006, farmers planted 304 million acres to grains, soybeans, cotton, and hay. Planted area to those same crops increased to 308 million acres in 2007. According to the Acreage report issued by the Department at the end of June, farmers planted 313 million acres to grains, soybeans, cotton, and hay in 2008. The Acreage report indicates farmers planted 7 percent less corn, but the decline in corn acreage was more than offset by a 17 percent increase in soybean acreage and a 5 percent increase in wheat acreage.

Strong increases in the prices of fertilizer and fuel likely dampened the incentive for farmers to expand crop production despite record high prices for most major crops. In March 2008, the prices farmers paid for fertilizer and fuel were up 67 and 47 percent, respectively, compared to one year ago.

Question 13. What was the total 2007 global supply of ethanol derived from corn-based, non-cellulosic sources? Under current law, when will the U.S. ethanol mandate exceed 2007's global supply of ethanol derived from corn-based, non-cellulosic sources?

Answer. The United States accounts for nearly all of the global production of corn-based ethanol. The renewable fuel standard (RFS) established under the Energy Independence and Security Act of 2007 was 4.7 billion gallons for 2007. In 2007, 6.5 billion gallons of corn-based ethanol were produced in the U.S. In 2008, the RFS increases to 9.0 billion gallons and thereby exceed 2007's global supply of ethanol derived from corn-based, non-cellulosic sources.

Question 14. We have seen that in tight markets, even the smallest changes in supply and demand can have dramatic affects on prices. And we all know that corn, rice, and other food commodity reserves around the world have been reduced over the past several years. Is it your testimony that we are not in a tight market and that the diversion of corn to ethanol production does not have an appreciable affect on food prices?

Answer. We are certainly in a tight market situation for corn, wheat, and some other crops. My testimony indicates that corn-based ethanol has contributed to the increase in corn prices and to higher food prices. There are also many other factors that have caused corn prices to increase and have pushed food prices higher.

Question 15. Including both the growing cycle for corn and the production cycle for ethanol, how many gallons of water are required to produce one gallon of corn-based ethanol? Based on recent droughts and other water shortages in the United States, have you studied the impacts of water access and supply disruptions on other commodities as resources are diverted to producing ethanol? Are you concerned that water access will become an issue for farmers and ranchers? Please elaborate as to why?

Answer. A recent study released by the National Research Council (NRC) of the National Academy of Sciences titled "Water Implications of Biofuels Production in the United States" presented an estimate of the consumptive water use from an ethanol facility at 4 gallons of water per gallon of ethanol produced. Therefore, a 100 million gallon per year ethanol plant would use about 400 million gallons of water per year. This estimate is similar to a study by the Institute for Agricultural Trade Policy which estimated that Minnesota ethanol plants in 2005 averaged 4.2 gallons of water per gallon of ethanol.

With respect to the amount of water used in the production of corn, the most cited research indicates that it takes about 4,000 gallons of water to produce each bushel of corn. Assuming each bushel of corn yields 2.8 gallons of ethanol, it takes about 1,400 gallons of water to grow the corn to produce each gallon of ethanol, but is much higher for corn produced on irrigated land. Based on data from the 2002 Census of Agriculture, about 14 percent of corn acres in the United States are irrigated, representing 16 percent of U.S. corn production. Those corn acres that are irrigated use, on average, 1.2 acre-feet of water (almost 400,000 gallons) per harvested acre of corn. In States such as Iowa, Illinois, Indiana, and Minnesota which currently supply much of the corn for ethanol production, less than 3 percent of corn acres are irrigated, and the amount of water used on irrigated cropland in those States is about half the national average. The reliance on corn from States such as Iowa, Illinois, Indiana, and Minnesota likely led to the conclusion by the NRC that "In the next 5 to 10 years, increased agricultural production for biofuels will probably not alter the national-aggregate view of water use."

Continued growth in ethanol production as well as the introduction of new feedstocks for cellulosic-based ethanol could, however, have significant regional and local impacts. We recognize the importance of issues related to both water availability and water quality, especially as we continue to increase biofuel production as prescribed under the Energy Independence and Security Act of 2007.

RESPONSES OF JOSEPH GLAUBER TO QUESTIONS FROM SENATOR BURR

Question 16. What impact do you anticipate higher food prices will have over the next few years on U.S. foreign aid, specifically unilateral and U.S. contributions to international food aid programs?

Answer. The future level of food aid program funding depends on the amount of money the U.S. Congress appropriates for food aid programs. Assuming no increase in appropriated funding, higher food prices reduce the volume of food that can be purchased for food aid. In response to rising food prices and to improve the effectiveness of existing food aid programs, the Administration has requested increased funding for food aid programs and proposed allowing up to 25 percent of food aid funds be used to procure food from selected developing countries near the site of a food crisis.

Question 17. How do the expected 2009 U.S. corn stocks compare to U.S. stocks of corn for the last ten years, in terms of weeks-of-supply?

Answer. The Department projects U.S. corn stocks will be 673 million bushels on August 31, 2009 which is the equivalent of about 3 weeks of supply. Over the previous 10 years, ending stocks ranged from a low of 958 million bushels to a high of 2,114 million bushels. In terms of weeks of supply, corn ending stocks ranged from a low of 5 weeks to a high of 10 weeks over the previous 10 years. Question: What would USDA expect to happen if an additional four billion bushels of corn were introduced into the market tomorrow? In what ways would you expect the price of corn to change as a result of a sharply increased supply? Response: We would expect the price of corn to decline appreciably if an additional four billion bushels of corn were introduced into the market tomorrow.

Question 18. What analysis has USDA conducted to examine the secondary and tertiary effect increased corn prices and reduced production for 2008 will have on industries dependent on corn, specifically US hog production? What were the results?

Answer. In 2008, the Department expects pork production to increase 6.6 percent due to expansion triggered by positive returns to producers in 2006 and 2007 and strong productivity gains. The growth in production is expected to slow later in the year as producers respond to much higher feed costs. The most recent Quarterly Hogs and Pigs report indicated that producers farrowed 5 percent more sows during December 2007-February 2008, but intend to farrow 2 percent fewer sows during June 2008-August 2008. In 2008, hog prices are expected to average $46-$48 per cwt, compared with $47.09 per cwt in 2007.

In 2009, pork production is forecast to decline by 3 percent in response high feed costs. Lower pork production, coupled with declining supplies of competing meats,

is expected to boost hog prices to $47-$51 per cwt in 2009. Higher hog prices will help to mitigate the effects of higher feed costs on hog producers.

Question 19. Dr. Outlaw testified that there could be dramatic financial losses amongst meat producers that use corn as feed, as a result of the high corn prices. He expects that if current market conditions persist, the industry would be hit "with producer attrition." Given the heavy presence of hog and poultry production in North Carolina, can you quantify the negative impact these high corn prices could have on the livestock, dairy, hog, and poultry industries if the current market conditions persist? I am very concerned about what 'attrition' means in real terms, including livelihood and jobs in North Carolina and elsewhere, and think Congress needs to consider possible unintended economic and employment impacts that increased corn prices could be causing in the meat sector.

Answer. The effects of high corn prices on the livestock sector depend on many factors. High corn prices increase livestock producers feed costs. In response to high corn prices, some producers may be able to substitute alternative feeds that are less costly than corn. Other producers may be able to adjust their feeding rations to increase weight gain per pound of feed fed to livestock. In addition, the ability of individual producers to withstand high corn prices depends on the duration of the increase in corn prices, the debt position of the producer, the efficiency of the operation, and other financial and managerial characteristics of the operation. Furthermore, strong domestic and export demand may support livestock prices, helping to offset the increase in feed costs resulting from higher corn prices. Due to the complexity of the many factors that determine the profitability of individual livestock operations and the ability of operators to withstand the effects of higher feed and other costs, the Department does not have estimates of the employment impacts of increased corn prices on the meat sector.

RESPONSES OF JASON PYLE TO QUESTIONS FROM SENATOR DOMENICI

Question 1. In your opinion, would there be an effect on non-food based biofuels if a reduction to the RFS mandate was allowed?

Answer. Yes. The entire alternative fuel sector is a nascent industry. Where many crop-based biofuel industries have demonstrated outcomes on a commercial scale, non-food biofuel alternatives have yet to prove themselves and as such are in a disadvantaged position. A wide-spectrum RFS mandate reduction could severely hamper non-food biofuel opportunities. Volatility in the RFS will directly impact the development of non-food alternatives in the following ways:

- The RFS, coupled with tax and investment subsidies, signals to entrepreneurs and investors that the Government supports the commercial benefits and domestic-security potential of renewable fuel technologies. This support provides incentives to investment in new processes and enables emerging technologies to bridge the gap between development and commercial production.
- New fuel technologies are competing with the current petroleum industry which already has significantly depreciated capital equipment, low operating risk and has benefited from decades of various subsidies and incentives.
- The current RFS has been used by major US investors to analyze cost, risk and profit models. It is the same capital investors, using the same models, that non-food alternative fuel companies rely on for capital investment.
- Uncertainty in government policy is perceived as risk. Concerns over a possible RFS retraction could already be hindering investment in new technologies.
- An ambitious RFS, especially one that is technology-neutral by not favoring certain advanced biofuels with large carve-outs, sends a threefold message: interest in a domestic and renewable fuel source, stewardship for environmental stability at a national and global scale, and support for entrepreneurship and innovation. The United States have historically pioneered new technologies and supported their ideologies worldwide.
- A reduction to the RFS mandate signals a lack of commitment to a new energy future. The country has made the correct choice by moving to a domestic and environmentally responsible energy mix while there is still time. There will be many ups and downs along the road to an alternative energy mix. These will be far milder and far more manageable than a true oil shock or wide-scale war for energy products.

Question 2. In your testimony you discuss Sapphire Energy's "Green Crude Production." Would you please explain the technology used to make Green Crude and its benefits?

Answer. Botanical production of hydrocarbons is not a new phenomenon. Petroleum is derived from ancient algal fields. In a very real fashion, we are currently driving and flying on algal crude.

Unfortunately, wild algae growing in ponds, rivers and oceans are not suitable for world-scale cultivation, nor do they produce large quantities of useful fuel oils. This is similar to the fact that wild grains, fruits and vegetables are not suitable for wide-scale industrial farming—only the very specialized commercial varieties of these plants feed the world.

Sapphire has perfected the science of developing algal strains suitable for world-scale production. The result is Green Crude Production, a process where a properly developed algal strain produces hydrocarbon-rich oils nearly identical to petroleum crude oil.

Sapphire Energy has developed proprietary technology to develop strains of algae that produce the petroleum-substitute 'Green Crude'. These are the stages of Green Crude Production:

- Strain Development. Sapphire biologists develop an algal strain that has a collection of vital traits, including abundant oil production, crop protection properties, and environmental tolerance.
- Production. Sapphire Energy is now developing test-production facilities that will enable cost-effective algal growth at the enormous scale that will make in impact on U.S. energy needs. The oil is extracted into Green Crude, while the biomass serves a variety of uses, such as fertilizer or livestock feed.
- Refining. The resulting Green Crude can be introduced seamlessly into the existing U.S. petroleum refining infrastructure, replacing fossil fuel crude oil and producing gasoline, diesel, and jet fuels.

The benefits of Green Crude are as follows:

- Domestic. With adequate land and sunlight (of which the U.S. has abundant resources), Green Crude can reliably reduce and, ultimately, replace imported crude oil. The result is reduced spending on imported oil (currently $200 billion each year).
- Security. The U.S. relies heavily on imported petroleum resources, many of which are buried beneath countries with unstable or undesirable political climates. A renewable source of domestic crude oil will liberate the U.S. from international oil sources and ensure national energy security.
- Economy. As Sapphire's Green Crude Production becomes more efficient, the opportunity for less expensive oil will only increase, resulting in lower fuel prices for military and industrial applications, as well as for the individual consumer at the gas station.
- Food vs. Fuel. Algae are preferentially produced on non-arable land, using non-potable water. Green Crude Production requires no agricultural crops and no clearing of existing plant growth. Capable of thriving on barren desert land, algae can reduce the alternative fuel industry's need for valuable food crops.
- Infrastructure. Green Crude Production results in gasoline, diesel, and jet fuels, the same products already in use today in our existing military and civilian transportation fleet. Sapphire's fuel requires no costly alterations to vehicles, nor to refining and distribution technologies; the same systems in use today will refine and distribute Green Crude fuels.
- Environment. Algae absorb enormous amounts of carbon dioxide, the most prevalent greenhouse gas. Green Crude Production reduces carbon dioxide emissions. While the combustion of the resulting gasoline in car engines will re-emit some of this carbon, Sapphire's fuel will generate far less carbon in its entire life cycle than existing petroleum, ethanol, or biodiesel industries. In addition, algae use pollutants found in many industrial water and waste streams as nutrients. If collocated with industrial facilities, algae ponds can "scrub" the effluents of industrial facilities and remove contaminants and greenhouse gases before they reach the atmosphere.

Response of Jason Pyle to Question From Senator Lincoln

Question 1. Arkansas is well-positioned to be a leader in the biofuels industry with the abundance of raw materials, including forestry waste. I am very interested in the development of cellulosic biomass technology. Would you describe for the Committee your perception of the current state of cellulosic biomass technology? Where do we go from here?

Answer. Sapphire does not refine ethanol; however, we are supportive of the role that the ethanol industry contributes to the US energy future. Ethanol will be a val-

uable component to a nationwide renewable fuels plan. Ethanol is an excellent additive agent for gasoline because of its oxygenating properties.

The future of non-food ethanol lies in cellulosic technology. Logging and lumber waste, crop stover, leftover paper, switchgrass, certain types of algae, and even some municipal waste contain abundant cellulose that can be broken down into sugars to feed the ethanol fermentation process. If the refining process for cellulosic input can be worked out, there are many promising feedstock streams for cellulosic processes. Cellulosic ethanol can be produced domestically with renewable, waste feedstock, and as such should be developed as a liquid fuel option. The most significant step, at this point, is to develop a method for efficient conversion of cellulose to sugar.

The energy density of cellulosic biomass is relatively low; pound for pound, even a dense cellulose source like lumber waste will produce less energy than an equivalent weight of seed stock, such as corn, petroleum, or algae. In order to effectively move the US energy mix away from foreign petroleum, cellulosic fuel will not be sufficient. We will need several additional alternative liquid fuel technologies to meet the goals of energy security.

Though we at Sapphire Energy are commercially biased toward hydrocarbon fuels derived from algae, we recognize that cellulosic ethanol technology may prove to be a viable part of a national renewable fuels mix.

RESPONSE OF JACK HUTTNER TO QUESTION FROM SENATOR DOMENICI

Question 1a. In your testimony you mention that Genecor is on the verge of commercialization of second generation biofuels.

When do you expect to be producing commercial quantities?

Answer. A number of second generation biorefineries will be coming on line over the next 24 months. Most are pilot plants. Genencor, as part of its Joint Venture with DuPont, has announced that it will build its own pilot plant for operation in late 2009. We anticipate producing commercial volumes in a demonstration plant two years, or so, after that. At that point, the JV will be selling its integrated biorefinery solution to the market for deployment around the country.

Question 1b. Will there be enough biomass to produce significant amounts of advanced biofuels?

Answer. It is difficult to precisely quantify biomass availability since there is currently no market for lignocellulosic biomass and therefore no supply chain to harvest, collect, store and deliver it. However, based on data provided by the USDA and other sources, we estimate that there is near future (2020) potential of about 50 billion gallons of ethanol from biomass. This estimate is based on moderate improvements in yield but without any significant land use changes. This estimate assumes use of corn stover, rice straw, wheat straw, forest product residues and energy crops.

RESPONSE OF JACK HUTTNER TO QUESTION FROM SENATOR LINCOLN

Question 1a. In your testimony, you describe the U.S. biofuels industry as on the verge of commercializing second generation technology that will use non-food feedstocks such as corn stover, switch grass, and waste wood in its process. You discuss retrofitting existing ethanol infrastructure to handle the next generation of biofules such as cellulosic feedstocks in addition to grain.

Could you elaborate on how the use of ethanol facilities serves as a stepping stone to the development of additional biofuels?

Answer. We envision the first cellulosic ethanol plants will be attached as a front end to existing dry mill corn ethanol plants. It will utilize shared equipment, utilities and processes. As the technology matures, green field second generation biorefineries will be built. Obviously, the ethanol distribution systems and blending facilities of first generation ethanol will be needed as the starch based volumes are supplanted or expanded by cellulosic ethanol volumes.

Question 1b. How can Congress help transition the biofuels industry from ethanol to cellulosic and other second generation biofuels?

Answer. Industry needs a stable regulatory regime to make the investments in 2nd generation biofuels. Namely, the RFS needs to remain intact. Of particular importance is the preferential incentive for producers of cellulosic ethanol.

RESPONSES OF JOACHIM VON BRAUN TO QUESTIONS FROM SENATOR BINGAMAN

Question 1. Please explain the relationship between U.S. biofuels policy and the world food crisis. Is the root cause of the food crisis based on the price of agricultural commodities, or the physical supply of those commodities?

Answer. The root cause is the low growth in physical supply relative to growth in demand, and that is driving prices and price expectations. As a result of underlying market fundamentals as well as speculation, rising expectations, and hoarding food prices have surged drastically. Therefore, the current food crisis is driven by surging demand, aggravated by slow production response, and manifested in high food prices.

Question 2. U.S. agricultural yields have increased dramatically, while yields in developing countries have not improved at all. It seems that something in the international system is broken, when developed countries are producing more than they can consume, while developing countries are becoming ever less able to feed themselves. How has this happened, and what can we do to reverse this trend?

Answer. Yield growth has been slowing down throughout the world—both in developing and in developed countries. This can be explained with underinvestment in agriculture and agricultural R&D, as well as the switch in agricultural research priorities in developed countries away from productivity enhancement. For the long-run investments for sustained agricultural growth should be made. These include expanded public spending for rural infrastructure, services, agricultural research, science, and technology. Also, developed countries should facilitate the sharing of agricultural innovation and research that are relevant to enhancing productivity and transforming small-farm agriculture.

Question 3. The link between oil prices and U.S. food aid is troubling, as U.S. food aid is diminished by every uptick in world oil prices. The U.S. is giving less in aid just as people need the aid the most. How can we break this link between oil prices and food aid?

Answer. Food aid is indeed hard hit by rising oil prices through increasing food prices and freight costs. World Food Programme needs further support and that support should be made more reliable. To maintain a reliable food aid flow the food aid budget would need to become price indexed, i.e. increase at the rate of international food prices to protect the poor whose lives that depend on it. An additional option to respond to this problem is to switch more to local purchase of food for aid. Another option is to partly switch to cash transfers to households in need of food aid where markets offer sufficient food.

Question 4. Could you describe the elements of a sustainable biofuels industry that does not have negative implications for global agricultural commodity markets?

Answer. A sustainable biofuels industry uses technologies that have a positive energy balance and reduce greenhouse gas emissions. It does not have negative implications for markets when the choice of feedstock, cultivation practices, technologies employed does not compete for land, water, and biomass for food and feed. Feedstocks, cultivation practices, technologies should minimize the food-fuel competition and ensure environmental benefits. Examples are sweet sorghum, algae based technologies, jathropa, and sugar cane based technology at appropriate locations, as well as the use of by-products. Biofuel trade barriers should be removed to facilitate biofuel production in countries with a comparative advantage for such sustainable production that does not compete with food and feed.

Question 5. The current food crisis clearly requires the world's immediate attention. However, over the long term, is it possible that today's high prices could yield benefits for the agricultural sectors of developing countries that have not been able to compete with relatively inexpensive imports from developed countries?

Answer. Long-run benefits for farmers in developing countries are possible, if they are given the opportunity to benefit from the rising demand and prices for their products. This requires investment in infrastructure and science. Short-term action to provide access to seeds, fertilizers, and credit for the small farm sector, as well as long term agricultural investments would be crucial in that respect to facilitate early gains. Development aid to agriculture must increase.

RESPONSES OF JACK HUTTNER TO QUESTIONS FROM SENATOR DOMENICI

Question 1. In your opinion, is the growth in global population, global income, meat consumption, and corn and soybean consumption related to the increased price of corn and soybeans?

Answer. Yes, all of these factors contribute to the increase in demand for corn and soybeans and put an upward pressure to their price.

Question 2. In your opinion, how much of an impact is corn-based ethanol having on food prices?

Answer. Our (the International Food Policy Research Institute, IFPRI) estimates suggest that the increase of corn demand for ethanol has contributed 39 percent to the total increase in the real world price of corn (2000 to 2007). For more information, please refer to: Rosegrant, M. W. 2008. Biofuels and Grain Prices: Impacts and Policy Responses. Testimony for the U.S. Senate Committee on Homeland Security and Governmental Affairs. Washington, D.C.

Question 3. What are the primary crops of concern for global food shortages? Are those crops used for biofuels?

Answer. Staple grains are of primary concern for food shortages in the world, in particular for the poor in developing countries. The major grain used for ethanol production is corn (mainly in the USA) and oil seeds (mainly in Europe). As demand and prices of these crops increase, they affect the other crops through two channels: 1) on the supply side, the switch to greater energy crop cultivation leaves less resources available for the production of other crops; 2) on the demand side, higher energy crops prices increase demand for other crops and put upward pressure on their price as well. For instance the increase in the price of corn due to ethanol is a significant factor for the increase in prices of wheat and soy.

RESPONSES OF JACK HUTTNER TO QUESTIONS FROM SENATOR MENENDEZ

Question 1a. Although I asked Dr. von Braun this question during the hearing, there was not sufficient time for a detailed response, and I wanted to give you both the opportunity to respond in writing. The International Food Policy Research Institute reports that biofuel production accounts for 30% of the recent price increase agricultural commodities. World Bank economists have made similar claims. Yet the testimony of Mr. Glauber, based on USDA calculations, argues that biofuels only explain 3% of the rise in food prices. How do you explain the difference?

Answer. IFPRI's estimations (corn based ethanol contribution to price increase total 30% for all grains and 39% for corn) refer to accumulated real world grain price from 2000 to 2007 due to the increase in world biofuel demand.[1] The result is based on a global multi-country and multi-commodity model. Only on such a comprehensive basis a realistic price estimate is possible, due to the market linkages.

Related USDA statements: I am sure the USDA colleagues can best address the question related to their estimates; I only note that the USDA estimates seem to be based on a Council of Economic Advisors statement. Quote: ". . . total global increase in corn-based ethanol production accounts for about 13 percentage points of the 37% increase in corn prices, or about 1/3rd of the increase in corn prices over the past year[2007]. But because corn only represents a small fraction of the IMF Global Food Index, we estimate that the increase in total corn-base ethanol production has pushed up global food prices by about 1.2 percentage points of the 43% increase in global food prices, or about 3% of the increase over the past twelve months." Quote from Testimony of Edward P. Lazear, Chairman, council of Economic Advisors, before Senate Foreign Relations Committee Hearing on "Responding to the Global Food Crisis" May 14, 2008.

This seems to be the source cited by USDA's Chief Economist Joe Glauber—see May 19 Briefing from USDA officials USDA www; the figure that is comparable to other studies is the "1/3rd of the increase in corn prices" mentioned above, which is in the range of our estimates and those of others. We have not seen the details of a model analysis behind these estimates. The expression relative to IMF Global Food Index (the "about 3%") may have led to different interpretations of the main finding which actually seems to be quite similar in regard to the corn price effect (IFPRI: 39 percent over 2000-2007; USDA /CEA: 33 percent in 2007).

Question 1b. Do either or both of your models account for indirect impacts of increased corn production on wheat and soybean plantings?

Answer. IFPRI's IMPACT model captures the cross-effects between the major grains and other important crops, like soybeans, in terms of area response to price changes—so that when one crop's area goes up (and effects its own price through increased supply), then that price signal is responded to by the area that is harvested in another crop. Thus, the model does account for the effect of increased corn production on wheat and soybean plantings. Example: a hypothetical moratorium (closing down grain and oil seeds based biofuel production) could reduce international corn prices by about 20 percent and wheat prices by about 10 percent within 2 years.

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[1] For more information see Rosegrant, M. W. 2008. Biofuels and Grain Prices: Impacts and Policy Responses. Testimony for the U.S. Senate Committee on Homeland Security and Governmental Affairs. Washington, D.C.

Question 2. Are different time periods for calculating baselines or for making predictions?

Answer. IFPRI's base year was 2000, while USDA estimates only refer to 2007.

Question 3. Do differences between the IMF global food commodity price index and domestic metrics like the Consumer Price Index contribute to differing estimates of the impact of biofuels? Are there real differences between the domestic and international marketplaces which lead to biofuels having a disproportionate impact?

Answer. Since there are differences in global and national food price indexes, it does matter which index is used for estimations of the effects of biofuels on food price. Global prices are transmitted to varying degrees from international to domestic markets.

DEPARTMENT OF ENERGY,
DEPARTMENT OF AGRICULTURE,
June 11, 2008.

Hon. JEFF BINGAMAN,
Chairman, Committee on Energy and Natural Resources, U.S. Senate, Washington, DC.

DEAR MR. CHAIRMAN: Thank you for your May 12, 2008, letter concerning the current and projected impacts of biofuels on food and gasoline prices, among other issues. We emphatically agree with the suggestion in your press release of May 15 concerning this letter that "it's wise for folks to catch their breath and get better educated on the complexities before charging ahead with changes." We appreciate your leadership in this matter as well as this opportunity to address the current debate over the role of biofuels in our Nation's energy portfolio.

All of us recognize that high food prices and high gasoline prices are important "pocketbook" issues for American consumers. We also recognize the national and economic security importance of reducing our dependence on imported oil as well as the urgency of developing new, cleaner fuels to reduce greenhouse gas emissions. Our biofuels policy makes important contributions to each of these goals.

The food and fuel pricing issues about which you have raised questions are complex. We would again caution, therefore, against hasty judgments driven by highly questionable, agenda-driven calculations, some of which have been featured prominently in the popular press. Many analysts both within and outside of government are currently working to model these questions, and the one certainty is that our data will improve substantially in the months ahead.

It is clear, however, that biofuels are already moderating gasoline prices. That impact is likely to grow substantially as more biofuels come to market. Our preliminary analysis further suggests that current biofuels-related feedstock demand plays only a small role in global food supply and pricing. Moreover, the impact of biofuels on U.S. consumers is even smaller since the farm price of commodities accounts for less than twenty percent of U.S. consumers' food costs.

Our shared vision is a sustainable domestic biofuels industry centered in rural America. To that end, both our agencies as well as the Federal Biomass Research and Development Board, co-chaired by the Department of Agriculture's Under Secretary for Rural Development Tom Dorr and the Department of Energy's Assistant Secretary of Energy Efficiency and Renewable Energy Andy Karsner, are collaborating to build an integrated biofuels action plan. In order to achieve these goals, continued private sector investment is needed. Creating a stable, predictable policy environment for investors, as Congress did with the expanded Renewable Fuels Standard, is essential to scaling our biofuels use and deploying next-generation biofuels. Efforts to repeal that mandate would hinder progress toward reducing our dependence on imported oil and reducing greenhouse gas emissions.

At the same time, our agencies are committed to collecting and presenting accurate data, projecting potential impacts, and initiating the necessary and appropriate actions to ensure the sustainable growth of biofuels. To that end, both of our agencies have significantly ramped up our analytical efforts to ensure that we proceed with caution but also determination. Our agencies will continue to work closely with the Environmental Protection Agency as we undertake our respective responsibilities under Title II of the Energy Independence and Security Act of 2007.

Enclosed please find responses to each of your questions.

Sincerely,

SAMUEL W. BODMAN,
Secretary of Energy.

EDWARD T. SCHAFER,
Secretary of Agriculture.

[Enclosure.]

JOINT RESPONSES OF THE DEPARTMENTS OF ENERGY AND AGRICULTURE TO QUESTIONS FROM SENATOR BINGAMAN

Question 1. How has increased U.S. ethanol and biodiesel consumption affected domestic agriculture, and domestic food prices?

Answer. In 2007, the expansion in ethanol and biodiesel consumption is estimated to have increased the Consumer Price Index (CPI) for all food by 0.10-0.15 percentage point. In other words, ethanol and biodiesel consumption accounted for approximately 3-4 percent of the overall rise in retail food prices. During the first 4 months of 2008, the all food CPI increased by 4.8 percent, with increased ethanol and biodiesel consumption accounting for only about 4-5 percent of the total increase while other factors accounted for 95-96 percent of the increase.

Increased demand for biofuel feedstocks has benefited corn and soybean producers. Higher prices have encouraged production increases and some switching of acreage from soybeans to corn. More dried distiller grains are available for feed, but higher grain prices are also prompting adjustments by livestock producers. In future years, production adjustments by livestock and dairy producers in response to higher feed costs resulting from the expansion in ethanol and biodiesel consumption could add a total of 0.6-0.7 percentage point to the CPI for all food.

Commodities prices, both agricultural and nonagricultural, have risen sharply in recent years for a number of reasons unrelated to biofuels development. For agricultural commodities, higher incomes, population growth, and depreciation of the dollar are increasing the demand for food; drought and dry weather have lowered production and reduced stocks; and some countries have imposed export restrictions. All these factors contribute to higher commodity prices. In addition, record prices for gasoline and diesel fuel are increasing the costs of producing, transporting, and processing food products.

Question 2. Has increased ethanol and biodiesel consumption in the United States contributed to increased global prices for agricultural goods? And if so, to what extent?

Answer. As discussed in Question 1, many factors are contributing to rising global prices for agricultural goods. From April 2007 to April 2008, in the absence of any growth in biofuel production in the United States, we estimate that the International Monetary Fund (IMF) global food commodity price index would have risen by 40.6 to 42 percent as opposed to 45 percent.

It should be noted that the impact on consumers of increased commodity prices, including increases driven by ethanol and biodiesel production, is subject to considerable uncertainty. The IMF global food commodity price index is often quoted as an indicator of the change in global food prices. The IMF global food commodity price index includes a bundle of agricultural commodities, including cereals such as wheat, corn (maize), rice, and barley as well as vegetable oils and protein meals, meat, seafood, sugar, bananas, and oranges. In the United States, however, the farm price of commodities accounts for approximately 20 percent of the retail food cost to consumers. This percentage will vary from country to country depending on diet and the proportion of staples versus highly processed food consumed. It is unclear how the list of commodities and the prices used in the IMF index relate to the foods purchased and the prices paid for food items by consumers in less developed countries.

Question 3. How might increased biodiesel consumption, as required by EISA beginning in 2009, affect domestic and international food prices?

Answer. The estimated increase in the price of soybean oil due to EISA would increase the CPI for all food by about 0.20-0.30 percentage point if fully passed on to consumers in the form of increased prices for foods containing soybean oil and other oils that compete with soybean oil. This increase is likely to occur over a several-year period since the EISA mandates a phased increase of biodiesel consumption beginning in 2009/10.

The estimated increase in the price of soybeans and soybean oil under the EISA would increase the IMF global food commodity price index by 1-2 percent.

Question 4. How has increased ethanol and biodiesel consumption affected gasoline and diesel prices?

Answer. Biodiesel use has had a negligible effect on diesel fuel prices since biodiesel fuel production is so small compared to total diesel fuel use. Without ethanol, gasoline prices would be higher. Even during the period in which MTBE was being phased out (2006) and ethanol prices were very high, had ethanol not been available, gasoline prices would have been even higher. After the Renewable Fuel Stand-

ard (RFS), established in the Energy Policy Act of 2005,[1] ethanol use has helped to reduce the price of gasoline to the consumer. Ethanol use has exceeded the requirements of the RFS, demonstrating that refiners and gasoline marketers have an economic advantage to use more ethanol than is required by law.

Table 1 (Appendix IV) shows the estimated reduction of gasoline demand due to the use of ethanol. We estimate that in 2008 we will use 9 billion gallons of ethanol. Without ethanol, we would have to use 7.2 billion more gallons of gasoline (5% more gasoline) in order to maintain current levels of travel. We would only meet the demand for more gasoline without using ethanol mixtures by bidding up the price of gasoline.

In addition, ethanol is less costly than the refiner's average mix of gasoline components. The cost of ethanol to refiners (after accounting for the $0.51/gallon ethanol blender's tax credit) has been lower than the production cost of conventional gasoline.[2] This explains why ethanol demand has been higher than required by the RFS. We estimate that, if we had not been blending ethanol into gasoline, gasoline prices would be between 20 cents per gallon to 35 cents per gallon higher.[3]

Question 5. What prices levels for gasoline and diesel fuel would be expected if biofuels were removed from the market, both in the short-and long-term?

Answer. This question can be interpreted in two ways: (a) What would happen to gasoline prices if the RFS were relaxed or eliminated? (b) What would happen to gasoline prices if there were a disruption in the supply of renewable fuels?

a) If we assume the mandates are relaxed, the short-term price effect would likely be minimal given the near-term supply economics for the renewable fuels and petroleum. Over 8 billion gallons of ethanol production is in place, and an additional 6 billion is under construction. We can therefore expect that 13 billion gallons of ethanol will be available to the market as long as these plants can recover their variable cost of production and have the regulatory certainty of a continued market. The RFS will not require this much corn ethanol until 2012, although it will, by 2012, require 2 billion gallons of advanced biofuels, not made from corn. Consequently, we do not expect that the RFS could appreciably raise gasoline prices until after 2012 when the requirements for advanced biofuels become significantly higher. After 2012, the price effect of ethanol will depend on several factors including oil prices and the availability of ethanol tax credits.

b) If we assumed a supply disruption of ethanol, we would expect a fairly large increase in the price of gasoline until ethanol supply were re-established or new market equilibriums were achieved. We do not have an estimate of how large this price increase would be. Because this is a hypothetical scenario, without a well-defined physical cause, it is difficult to produce with a meaningful price-impact estimate.

Question 6. What effects are biofuels expected to have on gasoline and diesel markets as consumption increases to meet the targets laid out in EISA?

Answer. Unless crude oil prices moderate dramatically, we expect that the ethanol use will reduce gasoline prices through 2012. Impacts after 2012 depend on a number of assumptions including the rate of technology development for the second generation renewable fuels, the supply and demand of transportation fuels and crude oil, the market mechanisms that develop to ensure increasing market demand for renewable fuels, the investment in second generation renewable fuel production capacity, the availability of flexible fuel vehicles, infrastructure for renewable feedstock and fuel transportation and distribution, and whether Clean Air Act RFS fuel waivers are issued.

APPENDIX I.—FURTHER DETAIL ON QUESTION 1

How has increased U.S. ethanol and biodiesel consumption affected domestic agriculture, and domestic food prices?

The amount of corn converted into ethanol and soybean oil converted into biodiesel in the United States is projected to nearly double from the 2005/06 marketing year (September 1, 2005—August 31, 2006) to the current 2007/08 marketing year (September 1, 2007—August 31, 2008). The growth in biofuels production has coincided with rising grain and oilseed prices. From 2005/06 to 2007/08, the average

[1] The Energy Policy Act of 2005 also eliminated the reformulated gasoline oxygenate requirement.

[2] Based on OPIS data for spot prices of ethanol (after rebate) and conventional gasoline.

[3] This estimate relies on data on the current price difference between ethanol and gasoline and the elasticity of supply for petroleum. Consequently a range is presented.

farm price of corn more than doubled, and the price of soybeans nearly doubled, with both reaching new record highs.

While increased biofuels production is partially responsible for the increase in corn and soybean prices, many other factors have also contributed to the sharp increase in prices for these commodities. Some of these factors include:

- Higher incomes, population growth, and depreciation of the dollar are increasing the demand for processed foods and meat in rapidly growing developing countries such as India and China. These shifts in diets are leading to major changes in international trade. For example, U.S. corn exports are projected to reach a record of 2.5 billion bushels in 2007/08 despite record high corn prices.
- Drought and dry weather have affected grain production in Australia, Canada, Ukraine, the European Union, and the United States in 2007/08. These weather events have helped to deplete world grain stocks. The tight stocks situation is leading to increasing concerns that prices could move sharply higher if this year's harvest falls below expectations. These concerns are causing some importers to purchase for future needs, pushing prices higher.
- Many exporting countries have put in place export restrictions in an effort to reduce domestic food price inflation. By reducing supplies available for world commerce, these actions have exacerbated the surge in global commodity prices.
- Record high prices for diesel fuel, gasoline, natural gas, and other forms of energy affect costs throughout the food production and marketing chain. Higher energy prices increase producers' expenditures for fertilizer and fuel, driving up farm production costs and reducing the incentive for farmers to expand production in the face of record high prices. Higher energy prices also increase food processing, marketing, and retailing costs. These higher costs, especially if maintained over a long period, tend to be passed on to consumers in the form of higher retail prices.

Estimating the effects of increased ethanol and biodiesel consumption on domestic agriculture and domestic food prices necessitates segmenting the portion of the increase in corn and soybean prices due to the expansion in ethanol and biodiesel consumption and the increase in corn and soybean prices due to other factors. Various analytical approaches were used to estimate the effects of increased ethanol and biodiesel consumption on corn and soybean prices. Table 1 (below) compares actual and estimated corn and soybean prices over the period 2005/06-2007/08, assuming corn used for ethanol and soybean oil used for biodiesel production in the United States remained unchanged from the amount used in the 2005/06 marketing year.

Under the alternative scenario, lower com and soybean oil use lowers the prices of com and soybeans. In addition, changes in relative returns for com and soybeans cause producers to switch from planting corn to planting soybeans. Lower com and soybean prices could also result in increased plantings and lower prices for other crops and lower feed costs to livestock producers.

The recent increase in com and soybean prices appears to have little to do with the run-up in prices of wheat and rice. Com and soybean prices began increasing during the fourth quarter of 2006. By this time, producers had already planted the 2007 winter wheat crop. Rice and spring wheat plantings could have been affected by increasing com and soybean prices, but weather problems, low stocks, and strong global demand likely had a much greater impact on wheat and rice prices than increasing com and soybean prices in 2007/08. In 2008, U.S. wheat producers indicate they intend to plant more acreage to wheat, while rice acreage is projected to remain flat, suggesting that higher com and soybean prices have not greatly altered wheat and rice producers' planting decisions.

Table 1. Estimated Effects of Increased Ethanol and Biodiesel Consumption on Corn and Soybean Prices

	2005/06	2006/07	2007/08
Corn Price ($/Bu.)			
Actual	2.00	3.04	4.25
Alternative 1/		2.80	3.60
Soybean Price ($/Bu.)			
Actual	5.66	6.43	10.00
Alternative 1/		6.25	8.25
Soybean Oil Price (cents/lb.)			
Actual	23.41	31.02	52.00
Alternative 1/		30.35	45.25
Soybean Meal Price ($/ton)			
Actual	174	205	315
Alternative 1/		201	274

1/Assumes the amount of corn used for ethanol and soybean oil used for biodiesel production in the United States remained unchanged from the amount used in the 2005/06 marketing year. This scenario was selected to depict the effects of increased ethanol and biodiesel consumption on corn and soybean prices and does not represent a specific policy scenario.

In 2007, the Consumer Price Index (CPI) for all food increased by 4.0 percent, up from 2.4 percent in both 2004 and 2005. In 2007, the retail price of eggs increased by 29.2 percent, retail dairy product prices rose by 7.4 percent, retail poultry prices posted a 5.2 percent gain, and retail beef prices increased by 4.4 percent. It is very unlikely that retail prices for dairy products, beef, poultry, and eggs were greatly affected by higher corn and soybean prices in 2007.

Higher corn and soybean prices increase livestock and dairy producers' feed costs. The increase in feed costs, with no offsetting increase in livestock prices, reduces livestock producers' margins. Livestock producers react to these lower margins over time by reducing the breeding herd. In the short term, higher feed costs lead to an increase in livestock slaughter and lower livestock prices. For milk and eggs, higher feed costs may have lowered production somewhat 2007, partially contributing to the increase in retail prices for these food products. However, other factors, such as low returns in 2006, strong demand, abnormally high international prices, especially for dairy products, and increasing use of eggs for hatching to expand broiler production likely contributed to the bulk ofthe increase in retail food prices for these commodities in 2007.

To estimate the effects of higher farm commodity prices due to growth in ethanol and biodiesel consumption in the United States on retail food prices, we assume that all of the increase in farm commodity prices is passed on to consumers through higher retail food prices. In 2007, the expansion in ethanol and biodiesel consumption is estimated to have increased the CPI for all food by 0.10-0.15 percentage point, or the expansion in ethanol and biodiesel consumption accounted for about 3-4 percent of the increase in retail food prices. During the first 4 months of 2008, the all food CPI increased by 4.8 percent, with increased ethanol and biodiesel consumption accounting for about 4-5 percent ofthe increase in retail food prices. Over time, livestock and dairy producers will adjust to higher feed costs by reducing production. In future years, production adjustments by livestock and dairy producers in response to higher feed costs resulting from the expansion in ethanol and biodiesel consumption could add a total of 0.6-0.7 percentage point to the CPI for all food.

APPENDIX II.—FURTHER DETAIL ON QUESTION 2

Has increased ethanol and biodiesel consumption in the United States contributed to increased global prices for agricultural goods? And ifso, to what extent?

The International Monetary Fund's (IMF) global food commodity price index is often quoted as an indicator of the change in global food prices. The IMF global food commodity price index includes a bundle of agricultural commodities including cereals such as wheat, corn (maize), rice, and barley as well as vegetable oils and protein meals, meat, seafood, sugar, bananas, and oranges. A complete list ofthe com-

modities included in the index, the percentage change in each commodity price, and the estimated contribution of each commodity to the overall percentage change in the food price index from April 2007 to April 2008 are presented in Table 1 (below). It is unclear how the list of commodities and the prices used in the IMF index relate to the foods purchased and the prices paid for food items by consumers in less developed countries.

Table 1. Contribution to the IMF Food Commodity Price Index, April 2007 to April 2008. 1/

Food Commodity	Weight	April 2007 to April 2008	Contribution to Overall Change
		Percentage Change	Percentage Points
Food	100	45.0	45.0
Cereals			
Wheat	10.9	82.7	9.0
Corn (Maize)	8.1	61.7	5.0
Rice	3.6	215.0	7.7
Barley	2.2	51.0	1.1
Vegetable oils and Protein Meals			
Soybeans	7.5	78.6	5.9
Soybean Meal	4.6	69.3	3.2
Soybean Oil	3.2	80.9	2.6
Palm Oil	6.2	67.9	4.2
Sunflower Oil	0.5	223.5	1.2
Olive Oil	1.3	-4.8	-0.1
Fish Meal	1.6	-8.1	-0.1
Groundnuts	1.5	66.6	1.0
Rapeseed Oil	2.0	87.1	1.7
Meat			
Beef	7.2	-11.8	-0.9
Lamb	1.3	16.9	0.2
Swine Meat	5.6	-6.5	-0.4
Poultry	4.7	5.0	0.2
Seafood			
Fish	15.2	7.2	1.1
Shrimp	3.7	-23.0	-0.8
Sugar			
Free Market	2.8	30.5	0.9
United States	0.2	-1.8	0.0
EU	1.2	-0.4	0.0
Bananas	2.3	49.9	1.2
Oranges	2.5	42.7	1.1

1/Estimated from the International Monetary Fund (IMF) 8 price indices and 49 actual price series. The prices are avai from the IMF web site at http://www.imf.org/

The IMF global food price commodity price index increased by an estimated 45 percent from April 2007 to April 2008. Sunflower oil and rice exhibited the largest price changes, with prices for both commodities increasing by over 200 percent. Prices for wheat, soybeans, soybean oil, palm oil, and rapeseed oil also exhibited relatively large price increases. Prices for wheat and soybeans increased by 82.7 and 78.6 percent, respectively, while the prices for beef and swine meat actually fell by 11.8 and 6.5 percent, respectively.

The price ofcom increased by 61.7 percent from April 2007 to April 2008. Combining the change in com prices with the com weight of 8.1 percent, the change in com prices contributed5.0 percentage points to the estimated 45 percent increase in the global food commodity price index. Soybeans, soybean oil, and soybean meal exhibited larger price increases and playa much larger role in the global food commodity price index, a combined weight ofover 15 percent. The combined effects ofthe increase in soybean, soybean meal, and soybean oil prices contributed 11.7 percentage points to the estimated 45 percent increase in the IMF global food commodity price index from April 2007 to April 2008.

In order to estimate the impact of the increased production of U.S. biofuels on global food prices, one needs to estimate the direct and indirect effects of the increased use of com and soybeans on individual commodity prices. Last month, CEA testified before the Senate Foreign Relations Committee about com-based ethanol's impact on global food prices using this strategy. The analysis below continues in this spirit, but it considers a broader category of factors and costs and a slightly

different time period. Here the analysis is updated to the 12 months ending in April, and the analysis considers a broader mix of biofuels-focusing on com-based and soybean oil-based biofuels.

Table 2 (below) presents the estimated effects of ethanol and biodiesel production in the United States on global prices for com (maize), soybeans, soybean meal, and soybean oil as well as the impact on the IMF global food commodity price index. It is important to point out that the price impacts reflect greater ethanol and biodiesel production and not only ethanol.

The estimated impacts on global food prices are consistent with the estimates in response to Question 1. We estimate that the percentage increase in price ofcom from April 2007 to April 2008 would have been 23 percent lower in the absence of any growth in biofuel production in the United States. Based on this analysis, we estimate that the price of com would have increased by 47.5 percent assuming no growth in biofuel production in the United States, down from the actual increase of61.7 percent, from April 2007 to April 2008.

Table 2. Effects of growth in biofuel production in the United States on global food commodity prices.

	With Biofuels	Without Biofuels
	Percentage Change	Percentage Change
	April 2007 compared to April 2008	
Food	45.0	40.6
Corn (Maize)	61.7	47.5
Soybeans	78.6	54.2
Soybean Meal	69.3	51.2
Soybean Oil	80.9	61.5

The growth in biofuel production in the United States also has pushed up soybean, soybean meal, and soybean oil prices. We estimate the percentage increase in the prices of soybeans, soybean meal, and soybean oil from April 2007 to April 2008 would have been about 25 to 30 percent lower in the absence of any growth in biofuel production in the United States. Assuming no growth in biofuel production, the price of soybeans, soybean meal, and soybean oil in the global food commodity price index would have increased by 54.2, 51.2, and 61.5 percent, respectively, down from actual increases of78.6, 69.3, and 80.9 percent, respectively, from April 2007 to April 2008.

The effects ofbiofuel production in the United States on global price for agricultural goods is estimated by combining the individual commodity price impacts with their relative weights in the IMF global food commodity price index. Assuming no growth in biofuel production in the United States, the IMF global food commodity price index would have increased by 40.6 percent compared to the actual increase of 45 percent, from April 2007 to April 2008. Lower com prices contributed 1.2 percentage points, lower soybean, soybean meal, and soybean oil prices contributed 3.2 percentage points to the total reduction in the global food commodity price index.

However, combining soybeans, soybean meal, and soybean oil in the same index overstates the impact ofbiofuels on global prices. Soybeans are processed into soybean meal and oil and by including the effects ofbiofuels on the prices of all three commodities we magnify the impacts of biofuels on the global price index. If we exclude the impact of biofuels on soybean meal and oil prices, the IMF global food commodity price index would have increased by 42 percent assuming no growth in biofuels production compared to the actual increase of 45 percent, from April 2007 to April 2008.

APPENDIX III.—FURTHER DETAIL ON QUESTION 3

How might increased biodiesel consumption, as required by EISA beginning in 2009, affect domestic and international food prices?

Under pre-EISA policies, USDA had projected that soybean oil use for biodiesel would be4.2 billion pounds in 2009/1 0 and average 4.4 billion pounds over 2013-2018. EISA requires the use of 500 million gallons of biomass-based diesel fuel by 2009; 650 million gallons by 2010; 800 million gallons by 2011; and 1 billion gallons of biomass-based diesel fuel by 2012. This would raise soybean oil consumption for biodiesel by about 70 percent by 2011/12.

To estimate the effects on soybean oil and soybean prices, we derived price multipliers from a recent analysis ofthe EISA by the Food and Agricultural Policy Research Institute (FAPRI). In estimating the effects of the EISA on biodiesel use and soybean prices, the FAPRI analysis shows that for a 10-percent increase in soybean oil use for biodiesel, soybean oil prices were estimated to rise by about 4 percent,

while soybean prices were estimated to rise by about 1 percent (see Table 1, below). Based on these values, it is estimated that increased biodiesel consumption could cause soybean oil prices to rise by about 32 percent over pre-EISA baseline levels by 2012/13. Similarly, it is estimated that soybean prices would rise by about 7 percent relative to pre-EISA baseline levels.

The estimated increase in the price of soybean oil would increase the CPI for all food by about 0.20-0.30 percentage points if fully passed on to consumers in the form of increased prices for foods containing soybean oil and other oils that compete with soybean oil. The total increase of 0.20-0.30 percentage points in the CPI for all food could occur over a several-year period, especially as the EISA mandate increases biodiesel consumption beginning in 2009/10. The estimated increase in the price of soybeans and soybean oil under the EISA would increase the IMF global food commodity price index by 1-2 percentage points.

Table 1. Effects of the EISA Biodiesel Mandate on Soybean and Soybean Oil Prices

	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18
Soybean oil used for biodiesel:	Million pounds								
Pre-EISA 1/	4200	4250	4250	4350	4400	4400	4400	4400	4400
EISA	5400	6300	7200	7500	7500	7500	7500	7500	7500
	28.6%	48.2%	69.4%	72.4%	70.5%	70.5%	70.5%	70.5%	70.5%
Soybean oil price:	Dollars per pound								
Pre-EISA 1/	0.385	0.383	0.383	0.383	0.383	0.385	0.385	0.385	0.385
EISA 2/	0.435	0.466	0.503	0.508	0.504	0.507	0.507	0.507	0.507
	12.9%	21.7%	31.2%	32.6%	31.7%	31.7%	31.7%	31.7%	31.7%
Soybean price:	Dollars per bushel								
Pre-EISA 1/	8.90	8.75	8.80	8.80	8.80	8.85	8.90	9.95	9.00
EISA	9.15	9.17	9.41	9.44	9.42	9.47	9.53	10.65	9.63
	2.9%	4.8%	6.9%	7.2%	7.0%	7.0%	7.0%	7.0%	7.0%

1/ USDA Agricultural Projections to 2017. Long-term Projections Report OCE-2008-1. February 2008.
2/ Food and Agricultural Policy Research Institute. "The Energy Independence and Security Act of 2007: Preliminary Evaluation of Selected Provisions." FAPRI MU #01-08. January 2008. Page 14, Table 6.

APPENDIX IV.—FURTHER DETAIL ON QUESTION 4

How has increased ethanol and biodiesel consumption affected gasoline and diesel prices?

Table 1. Petroleum Consumption Reduction Attributed to Ethanol Use
(thousand barrels per day)/(billion gallons/yr)

	2007	2008 (estimated)
Ethanol Demand	446/6.8	~590/9.0
Gasoline Displacement 1/	357/5.5	~472/7.2

1/ The methodology and references for deriving the fuel economy penalty for 10 percent ethanol/gasoline blends (E10) is based on the average of two technical analyses of consumption and emission effects performed on 1989 and 2001-2003 vintage vehicles. The first study conducted as part of the Auto/oil Air Quality Research Program indicated a 2.6 percent fuel economy decrement for E10 gasoline blends. The second study conducted by the Coordinating Research Council on 2001-2003 vintage vehicles indicated a 1.4 percent fuel economy decrement for E10 gasoline blends. Averaging the two studies results in a 2.0 percent fuel economy decrement for E10. Converting from fuel economy space (miles per gallon) to consumption space (gallons per mile) results in a 2.041 percent consumption penalty for E10 blends.

RESPONSES OF JOE L. OUTLAW TO QUESTIONS FROM SENATOR DOMENICI

Question 1. In your opinion, what is the underlying driving force for changes in the agricultural industry?

Answer. There are a number of underlying driving forces of change in agriculture. I am a co-author of one of the leading undergraduate textbooks on agricultural policy. In our book we identify eight forces of change in agriculture: instability of agriculture, globalization, technology, food safety, environment, industrialization, politics, and unforeseen events. While the importance of each of these factors varies

over time, in my opinion, over the past few years the most important factors have been the instability of agriculture, technology and unforeseen events. Specifically, this past year saw unforeseen weather events negatively impacted crop production worldwide. Combining the reduction in supply with the inelasticity of supply and demand of agricultural products gives us huge swings in commodity prices due to shifts in supply and demand causing the price and income instability we have recently realized. And finally, improvements in seed and GPS technology have perpetuated the technology treadmill effect where early adopters garner most of the financial benefits of new technology that decrease costs and induce others to follow in order to stay in business.

Question 2. In your testimony, you state that a reduction to the RFS mandate would not significantly reduce ethanol production or prices. Why?

Answer. At the time of the testimony, our models indicated that U.S. production of ethanol would easily exceed the RFS. Even though corn prices had increased to $6.00 per bushel, our results indicated that, on average, U.S. ethanol plants were still realizing small $0.06 per gallon profits at an ethanol price of $2.50 per gallon. This level of profitability, while not high enough to encourage new plant construction, is still positive so existing plants and those that were expected to come online later in 2008 would continue and surpass the RFS level.

Question 3. In your opinion, what is the long term viability of biofuels as an energy alternative?

Answer. The answer to this question depends entirely on 1) the level of oil prices and the corresponding gasoline and diesel prices, 2) the relative costs of production of each of the biofuels including corn and cellulosic based ethanol and biodiesel. If the costs of biofuels are relatively competitive with petroleum based fuels then there will be a future. If not, there will not be a future for them barring government subsidies.

Response of Joe L. Outlaw to Question From Senator Lincoln

Question 1. Based on your recent study, what is your opinion on the potential negative impacts a Renewable Fuel Standard waiver may have on second generation biofuels, such as the development of cellulosic biomass?

Answer. My answer is strictly my opinion and unfortunately is not backed up with the empirical analysis that was the basis for my answers to the previous questions. We have all witnessed substantial investment in ethanol and biodiesel that followed the enactment of the Energy Policy Act of 2005 and Energy Independence and Security Act of 2007. The question is how would potential second generation fuels investors react to a one year removal of the RFS mandate? Again, in my opinion, the removal of the mandate could be interpreted by potential investors as the beginning of the decline in government support for biofuels which may make them at least pause from going forward. Unlike, corn based ethanol which is generally competitive without the subsidies, most if not all of the cellulosic ethanol projects are not expected to initially be competitive with petroleum based fuels so there would have to be substantial government support for investors to move those projects forward.

APPENDIX II

Additional Material Submitted for the Record

MIDWESTERN GOVERNORS ASSOCIATION,
Washington, DC, June 3, 2008.

Hon. STEPHEN JOHNSON,
Administrator, Environmental Protection Agency, 1200 Pennsylvania Avenue, N.W., Washington, DC.

DEAR ADMINISTRATOR JOHNSON: On behalf of the Midwestern Governors Association (MGA), we respectfully urge you to uphold the new and higher Renewable Fuels Standard (RFS) in the Energy Independence and Security Act of 2007 as passed by Congress and signed by the President. Granting waivers to the RFS would be contrary to your agency's mission to protect human health and the environment.

A waiver would also contradict the President's "Twenty in Ten" plan that you worked on to pass. In his 2007 State of the Union Address, President Bush announced the plan to reduce U.S. gasoline usage by 20 percent in 10 years. One of the objectives of the plan is to strengthen our nation's energy security by reducing foreign oil dependency, and by promoting the development of homegrown, renewable energy sources. The plan called for increased use of renewable and alternative fuels, and set a goal of 36 billion gallons of renewable energy sources to be used in the U.S., as is reflected in the Energy Independence and Security Act of 2007.

The EPA's own analysis of the current RFS shows the increased use of renewable fuels, like ethanol, will reduce traditional car pollutants, such as benzene and carbon monoxide. Ethanol is non-toxic, water soluble, and biodegradable. In addition, ethanol poses no threat of contamination or degradation of surface or ground water.

The blame placed on ethanol for higher food prices is misguided. Higher food prices are the result of many factors, including rising transportation and production costs due to record oil prices, increased demand for grains and meat from developing countries, increased speculator investment and influence in all commodities markets, and extended global drought. As a result, all food commodity prices are high, not just the price of corn. In short, granting any waiver to the RFS will not reduce current food commodity prices.

The RFS actually helps move the ethanol industry toward use of cellulosic materials. The RFS will encourage the investment and technological innovations needed to make production of ethanol from cellulose a commercial reality.

When you addressed the National Ethanol Conference last year, you stated, "Bottom line—alternative domestic sources of energy are good for our economy, good for our energy security ... and are good for our environment." We could not agree more. We thank you for your time and consideration.

Sincerely,

M. MICHAEL ROUNDS,
Governor of South Dakota and Chair.

JENNIFER GRANHOLM,
Governor of Michigan and Vice Chair.

NATIONAL PETROCHEMICAL & REFINERS ASSOCIATION,
Washington, DC, June 27, 2008.

Hon. JEFF BINGAMAN,
Chairman, Committee on Energy and Natural Resources, U.S. Senate, Washington, DC.

DEAR CHAIRMAN BINGAMAN: NPRA, the National Petrochemical & Refiners Association, appreciates the opportunity to submit comments for the record regarding the Senate Energy and Natural Resources Committee's hearing on June 12, 2008 on the relationship between U.S. renewable fuels policy and food prices. NPRA is

a national trade association with close to 500 members, including those who own or operate virtually all U.S. refining capacity, as well as most of the nation's petrochemical manufacturers with processes similar to those of refiners. We specifically wanted to comment on answers the U.S. Department of Energy (DOE) and the U.S. Department of Agriculture (USDA) provided to the committee in response to your May 12, 2008 questions to both agencies. The answers below highlight our views on some of the questions you raised in that letter.

Question 1. How has increased U.S. ethanol and biodiesel consumption affected domestic agriculture, and domestic food prices?

Answer. Increased ethanol production in the U.S. has resulted in higher demand for corn. The U.S. Department of Agriculture (USDA) estimates that the amount of corn used at domestic ethanol plants was 2.1 billion bushels in 2006/2007 (9/1/06—9/1/07) and 3.0 billion bushels in 2007/2008, and the latest projection is 4.0 billion bushels in 2008/2009. This represented 23.3% of domestic corn demand in 2006/2007, 28.5% in 2007/2008, and 38.1 % in 2008/2009.[1] This growth in demand for corn to provide the feedstock for domestic ethanol production plants is substantial. Several recently released studies highlight the fact that this trend has significantly increased food and commodity prices well above the 3-4 percent range noted by USDA and the U.S. Department of Energy (DOE) in the June 11, 2008 response to your May 12, 2008 questions.

Global grain prices have increased dramatically over the last two years. It is unlikely that this is just a coincidence with U.S. biofuels programs. The chart below shows USDA data on wheat, corn and soybean price changes before and after EPAct05 was passed.

The increase in corn demand by ethanol production plants is a key factor in rising corn prices. As one recent study notes:

> Between 2006/07 and 2008/09, USDA forecasts indicate the increase in corn going to ethanol plants is expected to exceed the increase in total U.S. corn use. Because corn stocks are expected to fall to such low levels relative to total corn use and expected corn prices are so high, any surge in corn demand has an amplified effect on corn prices. In this environment, if substantially less corn were to be used in ethanol production than now expected, corn prices would be much lower. A simplified analytical approach suggests that expected corn prices may be 40 percent higher than they would be had corn used in ethanol production remained at the 2006/07 level. Expressed in an alternative way, the increase in corn expected to be used in ethanol between 2006/07 and 2008/09 may account for up to 60 percent of the increase in corn prices between 2006/07 and 2008/09.[2]

Recent studies also highlight the fact that—contrary to USDA and DOE's opinion—prices for products such as dairy, beef, poultry and eggs are in fact impacted by higher corn prices.

> For example, since corn is mainly used as a feed grain, higher corn prices in one year may not affect livestock prices for up to several years. That is the case today as U.S. meat production is expected to be record high in 2008 partly because high feed prices are causing increased slaughter of beef and dairy cows and sows. The consequence of this is more meat production today, but the reduction in breeding animals and herd sizes will mean lower meat production and higher meat prices over next several years.[3]

Corn shortages from the recent flooding in the Midwest will likely exacerbate this trend. In addition, such commodity inflation is locked in by the RFS, given the dramatic increases in quantities required to meet the mandate.

Energy prices are certainly a factor in rising prices for many products. High energy prices are of particular concern to the refining and petrochemical industry and are having a substantial, adverse impact on our businesses and consumers. However, energy prices have significantly less of an impact on food prices than commodity price increases. The USDA ERS's own model of retail food costs show that energy is three percent of the retail food dollar, and commodity costs are 19 percent of the retail food dollar. So, when commodity prices are rising at half again to more

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[1] USDA, "World Agricultural Supply and Demand Estimates," WASDE-459, June 10, 2008, p. 12. This is a monthly report. "Year A/B" is a marketing year beginning September 1 for corn: http://www.usda.gov/oce/commodity/wasde/latest.pdf

[2] Dr. Keith Collins, "The Role of Biofuels and Other Factors in Increasing Farm and Food Prices," June 19, 2008, p. 25.

[3] Ibid, p. 23.

than twice the rate of oil, how can ERS continue to argue that it is energy—and not biofuels policy—that is driving food inflation?

Questions 4 & 5. How has increased ethanol and biodiesel consumption affected gasoline and diesel prices? What price levels for gasoline and diesel would be expected if biofuels were removed from the market, both in the short-and long-term?

Answer. Hawaii, Minnesota, Missouri, and Oregon currently mandate ethanol in gasoline. Minnesota currently mandates biodiesel in diesel fuel and the state legislature recently required that the level of biodiesel in diesel fuels be increased. States that require biofuels with future effective dates are Florida, Montana, New Mexico, and Washington. About 65% of gasoline supplies produced in the U.S. contain ethanol today. Biodiesel is still a very, very small market (only about 1%) compared to petroleum diesel fuel. Several factors make price comparisons of the fuel supply with or without ethanol or biodiesel very difficult, such as:

- The very small size of the biodiesel market
- The extensive use of ethanol in gasoline
- Current state biofuel mandates
- Current subsidies and excise tax credits/reductions for biofuels
- The tariff on imported ethanol
- The lower energy content of ethanol and biodiesel relative to gasoline and diesel
- Higher wholesale infrastructure costs associated with ethanol use
- The large new federal renewable fuel standard for 2008

All of these factors combined make conclusions on price comparisons extremely questionable—particularly since many of these initiatives represent real costs to consumers that are not always clearly apparent. For example, lost tax revenue to the Highway Trust Fund from the ethanol excise tax credit is made up through direct payments from the General Treasury. These revenues are general taxpayer money and an expense to consumers. In addition, since ethanol can't be shipped via pipeline, it has to be trucked barged or railed. As discussed later, this method of shipment is more than three times as expensive a shipping gasoline via pipeline.

Ethanol prices are available at the following sites:

http://www.energy.ca.gov/gasoline/graphs/ethanol—10-year.html

http://www.energy.ca.gov/gasoline/graphs/ethanol 18-month.html

http://www.mda.state.mn.us/news/publications/renewable/ethanol/marketnewsreport.pdf

These sources document that ethanol prices are volatile and ethanol is not uniformly a very low-cost gasoline additive.

The "Ethanol Market News," prepared by the Minnesota Department of Agriculture, (http://www.mda.state.mn.us/news/publ ications/renewable/ethanol/marketnewsreport.pdf) shows a relationship between ethanol and gasoline prices. It is not evident from this chart that gasoline prices would be higher without ethanol because gasoline and ethanol prices are often close and ethanol prices are not always less expensive than gasoline prices. This is particularly important in light of the fact that a gallon of ethanol carries substantially less energy than a gallon of gasoline.

Finally, this analysis was conducted before the flooding in the Midwest, which wiped out a substantial portion of the corn crop. This disaster highlights yet another problem with the RFS. This event naturally limits the supply of corn for the rest of the year and could make compliance with this year's 9 billion gallon mandate difficult. Such a situation could create scarcity in the ethanol market, driving up not only corn prices, but the cost of RFS credits. If such a scenario comes to fruition, it could possibly lead to even higher fuel prices for American consumers.

Question 6. What effects are biofuels expected to have on gasoline and diesel markets as consumption increases to meet the targets laid out in EISA?

The U.S. will progress rapidly to the use of ethanol in nearly all gasoline. There will also be interest in expanding the E85 market and EPA's future decision on whether or not mid-level ethanol-gasoline blends meet the Agency's "substantially similar" definition of gasoline.[4]

As previously mentioned, a gallon of ethanol has a lower energy content than a gallon of gasoline. According to the Department of Energy's Office of Energy Efficiency and Renewable Energy, flex fuel vehicles (FFVs)—cars that can run on either gasoline or a mixture of 85 percent ethanol and 15 percent gasoline (known as

[4] For more information on "substantially similar:" http://www.epa.gov/otaq/additive.htm For more information on the EPA process to review mid-level ethanol-gasoline blends: http://www.ethanol.org/pdf/contentmgmt/Dave__Kortum__EPA.pdf

E85)—get "about 20-30% fewer miles per gallon when fueled with E85."[5] Similarly, a gallon of biodiesel has a lower energy content than a gallon of diesel fuel.[6] Therefore, increased use of E85 and biodiesel is a RFS compliance strategy, but will displace only a fraction of demand for gasoline and diesel fuel because of energy content and fuel economy differences. This difference in energy content highlights the facts that as ethanol use increases dramatically because of the RFS, consumers will be using a larger volume of transportation fuels and paying more. An example highlighting this phenomenon lies in the fact that the American Automobile Association (AAA) releases an "E85 MPG/BTU Adjusted Price" in its daily fuel gauge report. It has not been uncommon for this report to show an E85 adjusted price that exceeds the price of a gallon of gasoline by as much as 80 cents per gallon.[7]

A June 2007 GAO report also highlighted the higher costs associated with biofuels. Among several findings, the report noted: "According to NREL (National Renewable Energy Laboratory), the overall cost of transporting ethanol from production plants to fueling stations is estimated to range from 13 cents per gallon to 18 cents per gallon, depending on the distance traveled and the mode of transportation. In contrast, the overall cost of transporting petroleum fuels from refineries to fueling stations is estimated on a nationwide basis to be about 3 to 5 cents per gallon."[8] The dramatic increase in the biofuels mandate under the new law will increase strain on our already congested transportation infrastructure, which could very likely drive the costs of shipping ethanol up even further. In addition to these costs being passed on to consumers, strained transportation avenues could create fuel supply problems.

In order to achieve the enormous increase in ethanol consumption required under EI SA, there will need to be significant increases in Flex Fuel Vehicles (FFVs). These vehicles are the only ones capable of running on blends greater than E10, which will be the nationwide standard given the new RFS possibly as soon as 2010. The National Ethanol Vehicle Coalition estimates there are about 6 million FFV s on the road—a small fraction of the 240 million plus vehicles Americans are driving today.[9] While automakers have announced plans to make more of these vehicles, they plan on producing gasoline-only vehicles at substantially greater quantities. This situation means today's legacy fleet (e.g. the gasoline-only vehicles currently in the marketplace) and a large portion of the approximately 16 million automobiles that will be produced annually over the next several years, cannot or will not be able to run on blends greater than E-10. The corrosive nature of ethanol eats away at automotive pipes and creates engine problems in these vehicles. In order for blends between E-10 and E-85 (i .e. blended gasoline that contains somewhere between 10 and 85 percent ethanol, called "mid-level ethanol blends") to be viable in the fuel supply, automakers will have to certify that cars can run on these blends and warrantee those vehicles. Engine and fuel pump makers will not provide warranties for equipment if blends greater than E-10 are used with those products.

Ethanol blends greater than E10 are already starting to create disruptions in the fuel market. One boat owner in California recently initiated a lawsuit against gasoline producers for problems ethanol blended gasoline created in his boat engine—even though ethanol is mandated to be used in the fuel supply.[10]

In addition to challenges relating to vehicle fleets, the new mandate will require greater use of E85 generally, which has economic challenges related to refueling infrastructure. Because of the corrosiveness of ethanol, an E85 retail pump is different than a gasoline retail pump and, therefore, all gasoline stations do not have equipment compatible with E85. Equipment concerns include the underground storage tank, gauges, piping system, fittings, pumps, nozzles, and hoses. A member of the National Association of Convenience Stores (NACS) and the Society of Independent Gasoline Marketers of America (SIGMA) testified on June 7, 2007 before the Subcommittee on Energy and Air Quality of the House Committee on Energy and Commerce:

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[5] U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Fueleconomy.gov: http://www.fueleconomy.gov/feg/flextech.shtml.

[6] EPA, "A Comprehensive Analysis of Biodiesel Impacts on Exhaust Emissions, Draft Technical Report," EPA420-P-02-001, October 2002: http://www.epa.gov/otaq/models/analysis/biodsl/p02001.pdf

[7] For daily price information from AAA, see http://www.fuelgaugereport.com/.

[8] U.S. Government Accountability Office, "Biofuels: DOE Lacks a Strategic Approach to Coordinate Increasing Production with Infrastructure Development and Vehicle Needs," GAO-07-713, June 2007, p. 23.

[9] National Ethanol Vehicle Coalition website: http://www.e85fuel.com/e85101/faqs/number_ffvs.php

[10] Douglas, Elizabeth, "Boater sues over ethanol laces gasoline's effect on fiberglass tank," Los Angeles Times, April 15, 2008.

> For all of these conversions, including tank cleaning, we estimated the cost to be between $6,000 and $7,000. However, this does not include the dispenser itself. The two dispenser manufacturers each charge an additional fee for a new E-85 compatible dispenser—$8,000 for Dresser-Wayne and $7,300 for Gilbarco. Thus, a typical E-85 dispenser can cost upwards of $17,000 per unit. And this cost is for equipment that has not yet been certified compatible with E-85 by Underwriters Laboratories. . . . We have spoken with several retailers who lament their decision to install E-85 equipment because they have been unable to generate sufficient sales from these fueling positions to support their overall business model.[11]

Thank you again for the opportunity to provide comments for the record. We look forward to working with you regarding implementation of the RFS and other energy related issues before the Committee.

Sincerely,

CHARLES T. DREVNA,
President.

NATIONAL CATTLEMEN'S BEEF ASSOCIATION,
Washington, DC, June 12, 2008.

Hon. JEFF BINGAMAN,
Chairman, Energy & Natural Resources Committee, U.S. Senate, 304 Dirksen Senate Office Building, Washington, DC.

Hon. PETE DOMENICI,
Ranking Member, Energy & Natural Resources Committee, U.S. Senate,304 Dirksen Senate Office Building, Washington, DC.

DEAR CHAIRMAN BINGAMAN AND RANKING MEMBER DOMENICI: The National Cattlemen's Beef Association (NCBA) appreciates the opportunity to present our thoughts with regard to your hearing on "Renewable Fuels and Food Prices." Producer-directed and consumer-focused, NCBA is the largest and oldest organization representing America's cattle industry, and it is dedicated to preserving the beef industry's heritage and future profitability through leadership in education, marketing and public policy.

Cattle operations are an important contributor to small towns and rural economies across the United States. Taken in aggregate, cattle production plays a significant role in our nation with $50 billion in farm-gate receipts, which represents 20 percent of all U.S. on-farm income. However, the U.S. cattle industry is currently experiencing significant and unsustainable losses.

Many cattle feeders are currently losing about $150 per animal. With 525,000 head of steers and heifers going to market each week, that amounts to an average weekly industry loss of approximately $79 million. Cattle feeders are margin operators and these losses will be passed on to the foundation of our industry, the cow/calf producer. For every $1 per bushel increase in the price of corn a cattle feeder must pay $22 per hundred-weight less for a 550 lb. feeder steer in order to have a chance at maintaining the same income.

Ethanol production and support mechanisms, namely the RFS, the ethanol blender's tax credit and the ethanol import tariff, are not solely to blame for this precarious situation. Other factors including the value of the dollar, elevated energy prices, increased international demand for grain and meat products, and the weather certainly play a role in determining food and feed costs. But, the demand pressure created by the RFS and ethanol tax incentives is also a contributor, and it is the only factor that Congress can control.

As a Committee of jurisdiction over this issue, NCBA strongly urges you to re-evaluate the mandate schedule established in the Energy Independence & Security Act of 2007 (EISA) in light of the commodity supply and price issues we are now facing.

ETHANOL INDUSTRY DEVELOPMENT AND PRODUCTION

While elimination of the oxygenate methyl tertiary butyl ether (MTBE) along with high crude oil and gasoline prices have played a role in the development of ethanol production, a number of government policies have rapidly accelerated the investment, including: the Volumetric Ethanol Excise Tax Credit (VEETC) of $0.51/gallon provided to blenders of ethanol, a $0.54/gallon tariff on imported ethanol, and the

[11] http://energycommerce.house.gov/cmte__mtgs/110-eaq-hrg.060707.Hubbard-testimony.pdf

RFS which was amended and dramatically increased as part of EISA to mandate the production and use of 9 billion gallons of feed-grain based ethanol this year and 15 billion gallons by 2015.

As of June 9th the Renewable Fuels Association (RFA), the national trade association for the U.S. ethanol industry, reported that the United States has 154 operational ethanol plants with the capacity to produce 8.8 billion gallons of ethanol per year. Additionally, RFA reported 49 new plants under construction, bringing total expected ethanol production capacity to nearly 13.7 billion gallons of ethanol per year.

Once operational, these 203 ethanol facilities will require over 5 billion bushels of corn. This is not an inconsequential amount. Based upon current expectations for corn plantings and yield, that will be over 40 percent of the domestic corn supply in 2008—compared to the 13 percent of domestic corn supply that was devoted to fuel ethanol production in 2005.

Overall growth in the corn ethanol industry has been impressive, but it is important to recognize that it comes at a cost to livestock producers. Corn is the primary feed stock utilized to feed cattle for market, accounting for approximately 85 of every 100 pounds of cattle feed. In total, of the nearly six billion bushels of corn fed to livestock this year, roughly two billion will be fed to cattle. With the Omaha cash corn price last week at $6.18/bushel compared to $3.79/bushel one year earlier—an increase of over 60 percent from the previous year and 280 percent from the year before that—the impacts of corn-based ethanol development are being felt throughout the beef production chain.

It is important to recognize that this is not a cost that the cattle producer can readily pass along to the consumer. Although U.S. beef producers have successfully worked to build demand, and maintained it through increased retail beef prices over the past several years, there is only so much that a consumer is willing to pay before they begin to choose other protein sources. Therefore, in the short run, the majority of these higher feed costs are borne by cattle feeders, and in the long run, they will result in a contraction of the U.S. cow herd.

With the cost of their biggest feed input skyrocketing, and the overall profitability of their business threatened, it is understandable that many cattle producers have become skeptical of government intervention in the ethanol market. Cattle producers simply want to compete with the ethanol industry on a level playing field for each bushel of corn.

COMMODITY SUPPLIES AND PRODUCTION

U.S. cattle producers are committed to continuing to provide the safest, most affordable beef in the world, but given current expectations regarding crop production, they have a growing anxiety about the impact of renewable fuels policy on the prices of feed grains and livestock. In 2007, USDA reported that 25 percent of the U.S. corn crop was processed to produce ethanol. Compared to previous years this is a dramatic increase in the amount of corn diverted to ethanol production.

Even with strong corn prices in the marketplace USDA's most recent Prospective Plantings report indicated that U.S. corn acreage was expected to decline 8 percent from last year as some producers shifted production to other crops whose prices have been driven higher. The troubling news continued to accumulate with USDA's monthly Crop Report released on June 10, 2008. USDA cut the corn yield estimate by a whopping 5 bushels, down to 148.9 bushels/acre. This reduction projects a corn crop that is 10 percent smaller than last year. Furthermore, in order to maintain even "pipeline" supplies for corn, USDA was forced to cut its estimates for feed and residual use by 150 million bushels. This is a clear indication that USDA expects more corn to be directed away from cattle producers.

Meanwhile, the percentage of corn acres rated good and excellent by USDA fell by 3 percent during the first week of June, down to just 60 percent. Corn crop progress in the year 2002 was the worst in nearly two decades, and this year's good-excellent percentage is just 6 percent ahead of the 2002 figure. This is especially concerning given the major flooding and severe weather events that have continued to plague key corn growing regions. USDA's next estimate for total corn acreage will be released in the June 30 Acreage report; nevertheless, as of June 8 only 89 percent of the corn crop had emerged, which still leaves 2008 as the slowest year on record for corn emergence, lagging the 99 percent emergence at this time last year and the 5-year average of 95 percent.

NCBA recognizes that corn growers responded to increased demand last year by producing a record harvest; however, cattle producers do not operate in the past. Both the marketplace and Mother Nature have created a drastically different scenario this year. Lower acreage and below trend line yields can only mean one thing:

less corn. This decline in corn production will coincide with continued increases in the siphoning off of corn to produce ethanol; a diversion driven by both high oil prices and government policy.

ETHANOL CO-PRODUCT OPPORTUNITIES AND CHALLENGES

Cattle producers have not stood idle on the sidelines as these market developments have occurred. As corn is being diverted to supply the increasing demand of renewable fuels they are doing their best to adapt by utilizing alternative feedstuffs, such as co-products of the ethanol process like distillers grains, in rations. Distillers grains can be used in their wet (35 % dry matter), modified wet (50%), or dried (90%) form. Each bushel of corn used for ethanol production returns about 18 pounds of dried distiller grains, and as ethanol production continues to climb it will be increasingly important for our industry to utilize this product.

When a feedlot can obtain them, some producers are attempting to incorporate ethanol co-products at rates of up to 40 percent in the feed ration. However, these co-products cannot entirely replace corn in the ration, and there are other concerns with including them at high levels. First, there are concerns about diminished cattle performance due to increased sulphur content in the ration. Sulphur, which tends to suppress appetite and tie up micronutrients that are essential to cattle health, is often found at higher levels in distillers grains.

Producers are also concerned about the variability of the co-products from ethanol production. It has proven difficult to get a consistent product which, in turn, makes it hard to formulate a balanced ration. Furthermore, we're keeping a close eye on any impact that distillers grains might have on the quality of our end product. The beef industry has worked hard for many years to improve beef quality, and any changes to that quality could jeopardize a consumer's willingness to purchase beef. Finally, because distiller's grains are often priced at their energy equivalent to corn, they are not necessarily a "cheap" replacement for corn.

SUMMARY

Cattle producers are very concerned about the increasingly tight supply of key commodities. With U.S. wheat stocks at 60 year lows, soybean stocks at their lowest levels since 2003, and corn ending stocks, even with last year's record crop, well below the established 25 year average, the RFS is creating unnecessary pressure on feed and food prices. With current and forecast oil prices well above $100 per barrel, and with annual ethanol production capacity now at 13.7 billion gallons, it is clear that the corn ethanol industry no longer a 'fledgling industry' in need of government assistance.

NCBA does not believe that freezing the RFS will immediately reverse commodity price escalation, nor do cattle producers claim that it will single handedly address the difficult marketing environment that currently exists for our industry. But, the RFS is one factor contributing to higher feed prices and Congress should revisit this policy in order to bring about some relief for beef producers and consumers.

It should be made clear that NCBA supports the nation's commitment to reducing dependence on foreign energy by developing forms of renewable energy like ethanol. Our interest in encouraging a reevaluation of the RFS is not intended to undermine this objective; rather it is meant to ensure that our nation's energy policy is sustainable and consistent with the dynamics of today's marketplace. Cattle producers recognize that federal support of the ethanol industry helped to encourage the development of basic production technology, but they also believe in a market-based economy.

Government driven demand for corn via an RFS and tax credits unnecessarily intervenes in the market, decreasing the ability of supply and demand to appropriately signal market participants. Cattle producers have always depended on the free market to drive their business, and as long as cattle producers have the ability to compete on a level playing field with the ethanol industry for each bushel of corn, the U.S. beef industry can and will remain competitive.

In a time of sharply escalating food and energy costs NCBA appreciates the Energy and Natural Resources Committee holding a hearing regarding "Renewable Fuels and Food Prices." Cattle producer's share a desire to diversify our energy supply, and feel strongly that we must work together to meet this goal in a manner that will not pit our food, feed and fuel needs against each other.

In light of the current food and commodity price issues we are facing, NCBA urges you to reevaluate the RFS enacted as part of EISA. Further, cattle producers believe that Congress should also allow other ethanol support mechanisms, such as the blender's tax credit, to expire as scheduled. NCBA feels that it is time to level the

playing field and allow market forces rather than government intervention to guide the production and use of ethanol.

Sincerely,

ANDY GROSETA,
President.

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