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NATURAL GAS RESOURCES

HEARING

BEFORE THE

COMMITTEE ON ENERGY AND NATURAL RESOURCES UNITED STATES SENATE

ONE HUNDRED THIRTEENTH CONGRESS

FIRST SESSION

TO

EXPLORE OPPORTUNITIES AND CHALLENGES ASSOCIATED WITH AMERICA'S NATURAL GAS RESOURCES

FEBRUARY 12, 2013

Printed for the use of the
Committee on Energy and Natural Resources

U.S. GOVERNMENT PRINTING OFFICE

80–132 PDF WASHINGTON : 2013

For sale by the Superintendent of Documents, U.S. Government Printing Office
Internet: bookstore.gpo.gov Phone: toll free (866) 512–1800; DC area (202) 512–1800
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NATURAL GAS RESOURCES

TUESDAY, FEBRUARY 12, 2013

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

The committee met, pursuant to notice, at 10 a.m. in room SD–366, Dirksen Senate Office Building, Hon. Ron Wyden, chairman, presiding.

OPENING STATEMENT OF HON. RON WYDEN, U.S. SENATOR FROM OREGON

The CHAIRMAN. As the witnesses come in, I want to note to my colleagues this is going to be, even by Senate scheduling, a hectic morning. We anticipate having votes at 11 o'clock. We will go from now until about 11:15 on the hearing topic, which is natural gas challenges and opportunities. We will take a break at 11:15 for what I anticipate will be about an hour.

When it comes to natural gas, America is truly the land of opportunity.

First it's an economic opportunity. An affordable, stable gas supply provides a competitive advantage for American business that can spark a U.S. manufacturing renaissance. Second, it is an environmental opportunity. Gas is 50 percent cleaner than other fossil fuels, and it is a major reason why American CO_2 emissions have actually gone down in recent years.

Finally, it's an energy security opportunity. For the first time in decades, our Nation will be able to rely on its own U.S. energy resources, especially new oil and gas development from shale instead of being dependent on imports from the Middle East and other parts of the world that haven't always had our best interests at heart.

This is a major change for American energy policy. Thirty-six years ago the predecessor to this committee called the Interior an Insular Affairs Committee, and they held hearings on natural gas as the country faced a supply emergency that triggered shortages across the Northeastern United States. During that supply emergency hundreds of thousands of people were laid off as commerce and industry reduced hours or simply shut down altogether.

We in the Northwest, particularly Senator Cantwell and I, note that the committee at that time was chaired by our legendary Senator, Henry "Scoop" Jackson, and the committee released a report prepared by the Department of Defense predicting that liquefied natural gas imports would account for 10 percent of the country's gas supply.

The view expressed in that 1997–1977 committee report has dominated American energy policy until just a few years ago. In 2005, Congress, over the objection of some, swept aside the ability of States to even approve the siting of LNG import terminals. As recently as 2007, when the Congress last enacted major legislation the focus was still overwhelmingly on energy scarcity.

Today, the outlook could not be more different. Instead of scarcity and shortages, the prediction is that domestic production will soon outstrip American demand.

Given the dramatic change in the outlook for natural gas supply, it is clearly time for a fresh look at our current policies and to start thinking about how to update those policies to reflect a very new reality.

As part of today's hearing, the committee is interested in hearing from the witnesses what they think is needed to safeguard the advantages of affordable, stable gas supplies for our country. Now some of our witnesses are going to say the best approach is that the market will take care of things. Others are going to say caution is in order. Just a few years ago investors were still betting on building new natural gas import terminals. They now face, in communities across the country, billions of dollars worth of stranded investment.

It is hard to see the logic behind replacing that kind of speculation on gas imports with similar speculation on gas exports.

My own view is we have to make sure we don't miss this opportunity for our Nation's economy and millions of unemployed workers who are now looking for good paying, family-wage jobs in the American manufacturing sector.

As the CEO of Dow Chemical, Mr. Andrew Liveris will testify that if unfettered exports drive the price of gas back toward the $10 per thousand cubic feet (mcf) price America has seen in recent years, that would essentially eliminate any competitive advantage for American manufacturers and investment that could be made here at home, and it will essentially advantage overseas opportunities.

Instead of a manufacturing renaissance, major gas consumers could find themselves hit hard with energy price hikes and forced to side line job-creating efforts.

It's also important to keep in mind that the guidance the Energy Department now uses for evaluating gas export applications was originally created almost a quarter century ago for import policy.

It seems to me that it's now time to have a serious discussion as to whether the guidelines that are now in place at the Energy Department for approving export applications are what they need to be. A recent study commissioned by the Department of Energy to examine the impact of natural gas exports, in my view, raised more questions than it answered.

Now export policy is not the only issue on the table. It would also be a missed opportunity if the environmental benefits that natural gas can provide in terms of reduced CO_2 emissions were lost, lost because of inadequate attention to issues such as fracking, methane emissions flaring, and underground aquifers.

Communities across the country have already been in touch with the committee to share their thoughts and concerns about whether

the hydraulic fracturing process that's used to produce shale gas near their communities could result in the contamination of their groundwater supplies. That type of situation would not only be tragic for the affected community, but also could lead to citizens? pressure to shut down not only unsafe production, but also operations that were safe.

Colorado's Governor, who is here with us, the Honorable John Hickenlooper, who has been on the front lines in terms of grappling with these issues, is going to testify today on how he's worked to strike a balance between the economic and environmental interests in regulating natural gas production in his State. Governor, we are anxious to hear about how your approach could be a model for the country.

Here's my bottom line. Let's see if there is an economic and environmental sweet spot where U.S. gas producers can make enough money to continue producing, and U.S. manufacturers have an affordable, stable supply of natural gas and where the environment is not only protected, but actually benefits from greater use of natural gas to lower CO_2 emissions.

Today's hearing gives us a chance to look at these and other issues. I look forward to hearing from our witnesses.

Senator Murkowski and I have talked about these issues on a number of occasions, and I've worked very closely with her. Senator Murkowski, it's going to be a pleasure to serve with you during this session, and please go forward with any comments you'd like to make.

[The prepared statement of Senator Landrieu follows:]

PREPARED STATEMENT OF HON. MARY L. LANDRIEU, U.S. SENATOR FROM LOUISIANA

First, let me thank you all for taking time to appear today before this committee to share your expertise on the issue of natural gas development. You are here today because it is vital that we treat our newfound wealth of natural gas in a fashion which protects the interests of states, like Colorado, represented here by Governor Hickenlooper, manufacturing, represented by Mr. Liveris of Dow and Mr. Eisenberg of the National Association of manufacturers, the environmental community, represented by Ms. Beinecke and finally our producers, represented by Mr. Gerard.

This wealth of natural gas is extraordinary, with estimates indicating America currently has 317 trillion cubic feet of proven, accessible reserves, and a further 2,000 tcf in total resource base estimates.

This is enough to fulfill our current demand, a little over 24 bcf per day, for over 100 years.

Louisiana ranks second in natural gas production, behind only Texas, with 29 tcf in 2011, representing 10% of total national production.

This increased production has a direct impact on our economy, supporting 2.8 million jobs nationally, along with tens of billions in new investment.

In Louisiana, Methanex Corporation, which moved its last U.S. plant overseas in 1999, is now spending over $1 billion to move a methanol plant from Chile to Ascension parish, near Baton Rouge. This plant will produce the raw materials for everything from windshield washer fluid to paints and sealants, even wrinkle free shirts.

Williams, a petrochemical company based in Tulsa, is planning a new $400 ethylene plant also in Ascension parish, where they will supply our plastics manufacturers.

Finally, CF Industries, one of the world's largest producers of nitrogen fertilizer, is looking to spend $2.1 billion to build a new fertilizer plant in Ascension.

That's over $3.5 billion being invested in one parish in Louisiana, all thanks to our new abundance of domestic natural gas.

Statewide, this could add over 200,000 new jobs, in addition to the 81,000 already supported by natural gas development.

Of course, that isn't the whole story; nationwide, these same petrochemical, plastics, steel and fertilizer industries are planning to invest upwards of $80 billion in new plants and new capabilities.

One of the most important topics in our conversation about how best to approach this new wealth of natural gas is the issue of exports, specifically liquefied natural gas, to nations around the world. There are strong arguments to be made on each side, for and against the expansion of these exports, and I am sensitive to both.

I believe, however, that there is enough domestic production, and the capacity for enough production increase to support our vital manufacturing industry and allow for responsible levels of export.

The recent NERA study, commissioned by DOE, supports this view, and indicates that it is possible for a level of export to exist that both incentivizes increased production while at the same time continuing to provide our domestic consumers with reliable, low-cost natural gas.

I look forward to your testimonies, and to working with my colleagues to develop a commonsense approach to managing our natural gas supply.

STATEMENT OF HON. LISA MURKOWSKI, U.S. SENATOR FROM ALASKA

Senator MURKOWSKI. Thank you Mr. Chairman.

I'm pleased that for the first hearing of the 113th Congress that we are focusing on natural gas, the opportunities that natural gas clearly presents within the energy discussion as we look at our energy mix, our energy portfolio.

I think it is absolutely clear that much of the economic stimulus that we have seen—the jobs that have been created in recent years—is coming from our States that are providing opportunities within the natural gas sector.

So, I'm pleased that that's our focus today.

I welcome all of our witnesses.

Without a doubt, the new technology that we are seeing has enabled a natural gas boom that has changed our energy landscape and the outlook for our economy.

I have often said, this natural gas just didn't all of a sudden migrate to these areas. It's been there for a long time. But what has changed is our ability to access this resource using the new technology.

Natural gas is now an abundant, affordable, clean source of energy, providing great opportunities for economic growth, and an energy security.

Mr. Chairman, you mentioned, the position that we have moved to as a Nation, when we look at our energy sources just a few years ago, we were talking about the scarcity of our resources. We have now moved from a discussion about scarcity to one of abundance.

This requires us to look critically and perhaps rethink some of the conversations that we have had about energy.

Last week I introduced a proposal in a document about 115 pages, Energy 20–20, that I hope will spur us to conversations about energy and how we should be looking differently at energy because of exactly this—this paradigm shift, going from one of scarcity to relative abundance. Our resource base estimates have increased 44 percent for natural gas in less than 5 years. That's pretty incredible.

Production is up, prices are low.

There's been a positive impact on our greenhouse gas emissions.

In addition, our allies overseas are now looking at the United States, they want our natural gas, and we've got enough resources to help make that happen.

For these reasons though, we have to be thoughtful.

I would certainly agree in how we proceed in dealing with the issues that impact natural gas.

There are several pending reports and studies looking at hydraulic fracturing. We need to make sure that these efforts are reasonable, based on sound science and they don't result in unnecessary and overly burdensome regulatory requirements.

I think we need to take a very close look, a critical look, at existing State regulations before we move to impose blanket Federal rules that perhaps might cause more problems than they solve.

I've had an opportunity to be out in the Bakken Region.

I've been out in the Marcellus with my colleague, Senator Manchin, talking with my friends down in Texas about the Eagle Ford.

The fact of the matter is we've got different geology all around the country.

So when you're talking about a one-size-fits-all approach, maybe we need to look a little more critically at that.

We also need to be careful about intervening in efforts to export our LNG. There's a long established regulatory process for natural gas exports through the Department of Energy and through the FERC. This includes environmental review under NEPA. So before we reinvent the wheel, I think we need to look at existing laws and regulations and determine if and where there are deficiencies.

The debate on this issue has focused on the impacts to domestic natural gas prices and supply, but I think we also need to include within this discussion an understanding of the role that the market forces will play, not only on domestic prices, but the number of projects that may actually be built. These are mega projects that we are dealing with, in every sense of the word, ranging from $8 billion to $25 billion, depending on the amount of existing infrastructure.

Up in Alaska, we're talking about a project of about $65 billion.

This is real money.

Gas is a global commodity, and other countries, including Canada, are already moving forward.

So I don't think that dragging our feet is an option here, if we want to export our LNG.

We should also not forget the positive impacts that exports would have on our trade imbalance and the geopolitical benefits of exporting to our allies.

There are also other issues to discuss related to the natural gas industry, but I'd certainly be remiss if I didn't bring up the dire need for new pipeline infrastructure to move our natural gas resources to domestic markets and consumers.

We need to address the roadblocks that prevent many of these projects from moving forward.

I do hope that this hearing is just the start of a very important discussion on these and many other issues impacting our natural gas industry.

With that, I look forward to the comments from the witnesses that have gathered here this morning, and thank them for coming before the committee.

The CHAIRMAN. Thank you for an excellent statement Senator Murkowski.

I think all of us would agree that in a big and diverse country people have different impressions of the energy challenge.

I know that I will never forget when I went to Alaska and you served me a graham cracker treated with LNG,

Senator MURKOWSKI. Dinner.

The CHAIRMAN. and that, uh,

Senator MURKOWSKI. You're still alive to tell the story.

The CHAIRMAN [continuing]. I lived to tell about it.

So let's move now to our witnesses. Let me introduce them. The Honorable John Hickenlooper, Governor of Colorado; Mr. Andrew Liveris, Chairman and Chief Executive Officer of Dow Chemical; Mr. Ross Eisenberg, Vice President of the National Association of Manufacturers; Ms. Frances Beinecke of the Natural Resources Defense Council; Dr. Kenneth Medlock, a senior director for energy studies at the Baker Institute at Rice; and Mr. Jack Gerard, Ppresident of the American Petroleum Institute.

I would like to let a couple of our colleagues, Senator Udall and Senator Stabenow, introduce witnesses.

Why don't we begin with you, Senator Udall, since Governor Hickenlooper will be first, and then we'll go to Senator Stabenow.

Senator Udall.

Senator UDALL. Thank you Senator Wyden, Senator Murkowski.

It's great to start this new Congress off on this footing and with this important topic.

It's a true pleasure and treat for me to introduce our Governor, John Hickenlooper.

I know our other Senator, Michael Bennett, with whom I have a strong working relationship, shares the sentiments I'm going to share with the committee.

The Governor brings a great deal of policy expertise to natural gas legislation and the issues that we're discussing here today. John, I would tell you in part you're among friends.

There are 4 former Governors on the energy committee: Senator Alexander, Senator Hoeven, Senator Risch and Senator Manchin, and I know they share the experiences you've had leading an important State.

The Governor is a geologist.

He worked in the energy industry long before he became Denver's mayor and Colorado's Governor. By the way, I should mention, Mr. Chairman, that the Governor was in another energy industry between his days as a geologist and a public servant.

He started what's now recognized known as the No. 1 Craft Brewing industry in the country.

Colorado ranks No. 1 for beer production.

We also have a very robust Craft Brewing sector, if you will, and the Governor became a very successful businessman and restaurateur.

We are an all-of-the-above energy State.

The Governor's work is keeping us on the forefront of energy innovation and a creator of jobs in the energy industry.

I'm really pleased he's here, as he can talk directly and firsthand about the opportunities that we face, but also the lessons from the challenges that are in front of Colorado today.

So, again Governor, it's good to have you here. Thank you for taking time from a very busy schedule that you have.

I know our legislature is in session. It has 120 days to get up to mischief, as we sometimes do here in the Congress.

So I really appreciate you taking the time to join us here in Washington, DC. So welcome. It's great to see you here.

The CHAIRMAN. Senator Udall, thank you. We will not compare Oregon and Colorado now on the brew pub issue. That will be later.

Senator Stabenow.

Senator STABENOW. Good morning.

First Mr. Chairman, you look great sitting there, and welcome to the committee as our chairman. I know you and our ranking member are going to do great work leading us.

It's my great pleasure to introduce Andrew Liveris. I said before I corrected it, Ron is—Andrew Liveris, who is the CEO of Dow Chemical Company.

I think that doesn't really describe what Dow's about, though, because under Mr. Liveris' leadership, Dow has really become an energy and advanced manufacturing leader in the country.

So I'm very pleased that you're here in this very important discussion.

Mr. Liveris came to Dow in Australia in 1976 and moved up as president of Asia and Pacific operations to be chairman in 2006 and has a very deep knowledge of the importance of natural gas as a source of energy in manufacturing, as well as chemical feedstock to make so many of the products that we use every day.

He also serves on the President's Export Council and a number of other positions.

So welcome. It's wonderful to have you with us.

We are very proud to have you located in Michigan and touching so many important areas of innovation for the future.

The CHAIRMAN. Thank you Senator Stabenow.

We welcome all our witnesses.

We'd like you to try to see if you could stay in the vicinity of 6 minutes for your remarks. I know that there's always a compulsion to, you know, read everything. If you'd like to just summarize your views, that'll be accepted, and we'll make your prepared statement a part of the record in its entirety.

Governor, welcome.

STATEMENT OF JOHN W. HICKENLOOPER, GOVERNOR OF COLORADO, DENVER, CO

Governor Hickenlooper. Thank you Chairman Wyden. Senator Udall, thank you for your kind introduction.

The truth is I'm—I refer to myself as a recovering geologist these days.

It is true I went from one fluid to another in my business career.

Ranking Member Murkowski, thank you again for your efforts on behalf of energy and this country and to the rest of the Senate Energy and Natural Resources Committee.

Thank you for allowing us this opportunity.

The 3 interconnected issues right now facing our country—obviously the economy is undergoing a steady recovery, but we still have high unemployment, a deficit makes investment difficult, we're vulnerable to shocks from overseas and our productivity increases continue to demonstrate there are a lot of people out of work.

At the same time the Persian Gulf is more volatile than ever, and we see our national security—40 years after our first energy crisis, the oil is controlled by unfriendly regimes in many cases. A national security issue that remains.

Last, climate change. We've seen some serious drought and wildfires that remind us in Colorado of what the potential threat is from climate change.

I'm not about to get into a discussion of how fast the climate is changing or what the causes are, but I think these 3 issues: the economic recovery, the national security, and climate are tough challenges, but the crux of each of them is energy.

We recognize that domestic energy creates jobs, that less foreign imported oil enhances our national security and that we have a much cleaner energy that will lead to ability to protect our environment.

The key, of course, is to thread each of these needles.

Energy independence used to be a catch phrase, right, that people would throw around, but I think we are legitimately on the threshold of achieving it for the first time in my lifetime.

You know I studied geology back in the—I'm not trying to date myself—back in the 1970s when plate tectonics were just being begun to be believed and yet what we've seen in the last decade is truly transformational.

In 2005, 60 percent of our oil was imported. Last year, 41 percent was imported. That trend is going to go further.

Wind and solar, some of the alternative energies, have added diversity to our energy portfolio. Twenty years ago that was ridiculed, and now we see it very—in a very real sense.

I think our future is more secure with energy that's renewable, that's sustainable.

One way that that happens is by integrating, as Senator Udall mentioned, a kind of all-of-the-above policy.

We see that having cheaper natural gas means that we're more competitive as a country. My friend, Mr. Liveris, Liveris, we all have that challenge. Try having a name like Hickenlooper, Andrew, and you'll see.

But we see that chemical industries, the American fertilizer industries, a lot of these associated industries beginning to really take off.

Foreign investment in electricity-intensive industries also is coming home for the first time in decades largely because of inexpensive natural gas.

It's also worth pointing out that carbon emissions, because of inexpensive natural gas and the conversion of older, inefficient elec-

trical generation plants fueled by coal, are per capita—CO_2 emissions are the lowest since Eisenhower turned over the White House to John Kennedy.

We are, as a country,—even though we didn't ratify the Kyoto Protocols—we are half way toward compliance, and we have reduced our carbon emissions in the United States more than all that other signatories to the Kyoto Protocols.

This really is game-changing.

When I was a geologist this was unheard of. We'd find a big field, and we'd think, well, we're going to adjust how the value of coal—the value of oil, or the value of gas was going to be projected.

This has been a technological revolution.

We did fracking when I was a geologist. I—The first well I sat back in 1981 was a—we did a hydraulic fracking enterprise on that.

What's happened is we've had better technology, the discovery of massive—these tight shale and shale oil deposits.

The real transformation here is that we could see a natural gas supply that is legitimately a hundred years long, and we continue as the technology continues to improve, we find more gas at lower cost.

At the same time, this has brought exploration to the doorstep of communities that didn't have to deal with it before, and I think the issues around health and safety, of increased drilling, I mean these are industrial processes as they come close to our—closer to our schools, our homes and neighborhoods, we really have to take full advantage of the technology by insuring that we have the absolute strongest safeguards that you could possibly have and that includes regulations that capture methane emissions, that we reduce flaring of these emissions, make sure that we don't have any, I mean zero, fugitive methane, and that we protect our precious groundwater.

We passed years ago, or a year ago, regulations that required disclosure of the composition of fracking fluids so that we could protect intellectual property but at the same time reassure the public.

We worked with the NRDC, the Environmental Defense Fund, Halliburton and several large service companies.

At one point in my office, I'm not sure how this happened, but the new frack fluid is made with food additives, and somehow we all took a swig of frack fluid-the new frack fluid, and it was not terribly tasty, but again, I'm still alive to—like Senator Wyden coming back from Alaska is still alive to tell the story.

What we're trying to do is create a national model for how do we regulate gas extraction. We want to make sure we have, anytime we're remotely near neighborhoods, that we have green completions of drilling sites, robust groundwater manage—monitoring. We're going—making it mandatory for testing both before and after wells are drilled, that we have appropriate setbacks and that we focus on well bore integrity, make sure that we don't have communication around that well. We're pursuing each of these in Colorado and try to move aggressively to implement the EPA's greenhouse emissions regulations.

Simultaneously we're engaging on the universities and doing the most comprehensive study of air quality around some of these large fields to really be able to give facts instead of estimates around a lot of these issues.

But recognizing that we are creating thousands of jobs by having these—this energy created and extracted at home, we are increasing our national security, and we are dramatically reducing ground—greenhouse gas emissions.

I think our focus is to make sure that we continue this momentum that we seize upon this opportunity in such a way that we can have a regulatory environment that is comprehensive and rigorous, but at the same time allows us to continue these advances.

One primary goal throughout this is to make sure that we have sufficient public involvement in the creation of these rules and having industry have a voice, as well, so that we are in all ways balanced and that we can be transparent to the level that the public can feel that they are not working that they are not working against an unseen villain.

[The prepared statement of Governor Hickenlooper follows:]

PREPARED STATEMENT OF JOHN W. HICKENLOOPER, GOVERNOR, OF COLORADO, DENVER, CO

Mr. Chairman and members of the committee, thank you for this opportunity to offer Colorado's perspective on energy policy, as it relates to natural gas, the focus of this hearing.

Our economy is making a steady recovery, but we are still fragile. Too many Americans are out of work and the worldwide competition for jobs is a great challenge. The international situation is still volatile, particularly in the Persian Gulf. And record-setting high temperatures over the last decade remind us that climate change could have profoundly negative impacts on our planet.

Economic prosperity, national security and climate: Three generational challenges of tremendous importance.

Energy is at the crux of all these challenges.

If we get energy policy right, we'll make progress on all three.

Responsible development of natural gas—the subject of this hearing—is fundamental to a successful energy strategy.

Natural gas has made American industry more competitive. We have seen new investment in energy-intensive companies. American chemical and fertilizer industries are growing because of inexpensive natural gas. Foreign investment in electricity-intensive industries has also been flowing into the country, as natural gas helps keep utility rates low, even as domestic coal remains cheaper.

We are on target to be a net exporter of natural gas by 2020.

Domestic development of shale gas and oil, homegrown renewable energy and efficiency strategies are leading us toward energy independence. With less reliance on foreign sources, our exposure to the impacts of global events is reduced. Our oil imports are falling—to approximately 40 percent of our consumption, down from 60 percent as recently as 2006. By next year, imported oil is projected to make up just 32 percent of demand. More energy dollars will stay home, our dependence on foreign supplies will decrease.

A revolution in shale gas has brought welcome news. Inexpensive gas is driving down carbon emissions in the United States. Last year, the U.S. Energy Information Agency found CO2 emissions in the first four months of 2012 had fallen to 1992 levels. When you consider that our population has grown by 57 million since then, it translates to per capita carbon emissions at the lowest level since President Eisenhower left office in 1961.

Inexpensive natural gas, its associated efficiencies, and its limited environmental impact are leading utilities to switch from coal to gas. David Victor, Vice-Chairman on the World Economic Forum's Global Agenda Council on Energy Security, has written that this shift means U.S. emissions in 2012 are projected to be approximately 450 million tons lower than otherwise. That number is double the global impact of all the Kyoto treaty's signatories combined, including the European Union. This month, the Environmental Protection Agency reported that U.S. power plants

in 2011 produced 4.5 percent less CO_2 than in 2010, a drop the agency attributed to the benefits in switching from coal to gas, as well as increasing use of renewable energy.

This emerging data is nothing short of transformative. By improving extraction technologies and extending natural gas to new markets and new applications—including transportation—we can not only make the U.S. economy stronger and enhance our security and independence, but we can take significant steps toward reducing climate-warming emissions.

This doesn't mean abandoning a strategy focused on renewable energy; quite the opposite.

We must chart a parallel path, continuing investments in wind, solar and other renewable sources of energy, including conservation and efficiency. A coherent strategy for the future cannot be dependent on one fuel source. We need a diverse energy portfolio that drives the economy, and at the same time prepares for future contingencies.

This is the approach that President Obama has rightly championed—an "all-of-the-above" strategy—one that encourages domestic oil and gas production, continues investment in clean energy research and technologies, and partners with industry for dramatically more efficient automobiles. It is a forward-looking strategy that combines American ingenuity with a commitment to sustainability.

Colorado is moving forward with our own version of an "all-of-the-above" strategy, and natural gas is a significant part of our energy mix. We are also more broadly utilizing our abundant renewable sources, as well as working on legislation and other initiatives to mine efficiency and conservation for all they are worth.

We believe Colorado presents a model for the nation. Our approach is balanced. We are reaping the benefits of advanced technologies, not just in shale gas but also in renewable energy. We are encouraging efforts to make coal a cleaner source of energy, but while that research continues, we will work with the resources at hand.

Colorado has a long and proud history of oil and gas development. Our first oil well dates back to when Abraham Lincoln was president.

We rank fifth in natural gas production and tenth in oil production. Our diverse hydrocarbon resources encompass a variety of shale, tight sand, coal bed methane, and other formations that span the state. This landscape has changed over the years, and has taken a significant turn as operators combine improvements in hydraulic fracturing and horizontal drilling to unlock reserves of oil and gas in formations, such as the Niobrara in Colorado, historically considered impractical for extraction.

As a former geologist, I have some experience with this technology. We worked on so-called "frack jobs" when I was in the industry in the 1980s. The industry, incidentally funded by billions of federal research dollars in the 1990's, has made great advances since that time.

Colorado also has a history of creativity in its approach to energy. In 2004, we became the first state in the country to launch a renewable energy standard through a statewide voter initiative, one our legislature has strengthened in years since to become—at 30 percent—the second highest in the country. In 2010, we passed the landmark Clean Air Clean Jobs Act which switches much of our electrical generation from coal power plants to natural gas, thereby addressing both climate and air quality, and reducing water consumption.

Natural gas and renewable sources are proving to be ideal partners, since gas efficiently cycles on and off to pair with intermittent resources such as wind and solar power.

We are achieving these energy goals across party lines. Gov. Mary Fallin of Oklahoma and I are leading a bipartisan effort to promote the use of natural gas as a transportation fuel for state vehicles. What started with Oklahoma and Colorado a little over a year ago has now expanded to 22 states representing every region of the country.

With a little effort we see the potential for including the federal government and perhaps Canadian provinces and other partners to build a market for large vehicle fleets using natural gas.

These initiatives target larger and heavy duty vehicles. Converting from diesel power to compressed natural gas reaps the biggest benefit in reductions of carbon, particulates and other pollutants. We are also finding ways to expand the fueling infrastructure, so trash haulers, delivery vehicles, buses, and trucks have more options for refueling.

Electric vehicles also hold tremendous promise, particularly for automobile consumers in the future, and we should pursue their development. But we do not need to pick winners and losers at the start of the game. Let's continue to pursue a comprehensive approach and let the market work.

The expansion of natural gas certainly brings regulatory challenges. As development moves into more urbanized areas we must be responsive to public concerns about the health and safety of industrial processes near homes and schools. Working together state and local governments can minimize hazards through effective oversight and enforcement.

As patterns and the extent of oil and gas activities change due to constantly evolving technologies and economic demands, our regulatory approach has to adapt.

Mr. Chairman, to put it bluntly, natural gas has a place in making us more secure and is addressing climate change, but we'll need to make sure that the production side is as protective of our environment and human health as possible.

Our goal in Colorado is to be accountable for the highest ethical and environmental standards with a regulatory structure based on three principals—namely, that our regulations are reasonable, scientifically-based, and protective of health and safety.

Our aim is to reduce emissions including the capture of methane, and with, by necessity, the strictest rules in the country to protect air and water.

In 2008, Governor Bill Ritter secured legislative support for restructuring the composition of Colorado's Oil and Gas Conservation Commission, reducing industry representation and diversifying membership. This revamped commission embarked on a sweeping 18-month overhaul of regulations that produced new protections for the environment. These rules have become the basis for regulatory initiatives in other states and even other countries, the latest being Ukraine.

A year ago, working with such diverse partners as the Environmental Defense Fund and Halliburton, we passed regulations requiring disclosure of chemicals in hydraulic fracturing fluid. As described in a recent edition of The Economist these rules suggest an international model for disclosure, protecting trade secrets and intellectual property, while providing a basis for public accountability.

Colorado now requires mandatory water testing near drilling and completion sites both before and after operators conduct their activities. We are one of just three states in the country that has rules for mandatory groundwater sampling and the only state that requires post-drilling sampling.

This month we are also finalizing rules to reduce the impacts of drilling near communities. These rules increase the minimum distances between drilling sites and occupied buildings and require the most stringent mitigation requirements in the country to ensure work occurs with the least disturbance to nearby residents, with "green completions" required within 1,000 ft. of hospitals or schools.

In partnership with our universities, we are launching a comprehensive study of the impacts of natural gas drilling on air quality and public health. This comes after several steps in recent years to reduce the pollutants that originate at oil and gas facilities, including requirements for emission-control devices to capture the emissions that can otherwise escape prior to a pipeline connection.

Increased communication is central to our regulatory reform. Our Commission has two staff members dedicated exclusively to local government outreach and other staff members have devoted significant time working with government officials. We formed a task force to develop protocols for local government engagement that will further address the impacts of development.

Our new rules also include extensive notice and outreach requirements on the part of operators, both to local government representatives and citizens. All this has resulted in greater collaboration between our state regulators and officials at the local level, reinforcing what we know to be true about most difficult problems, namely, that conversation at the front-end reduces problems at the back-end.

In short, the natural gas revolution and growth of renewable energy technologies, present Colorado and the country with an extraordinary opportunity: to create jobs, to make us more secure, more energy-independent, and to do a better job of protecting the environment by reducing greenhouse gas emissions.

These are mission critical goals for our country.

Mr. Chairman, the history of Colorado is largely a story about American energy. From mining to oil exploration in the last century, and, in this century, leading a green energy revolution, Colorado has lessons to offer the country.

Our first oil well dates back to when Abraham Lincoln was president.

Of course, with the country torn apart by war, Mr. Lincoln faced deeper challenges than crafting bipartisan energy policy, but his second address to Congress has wisdom we can still draw from. He said, "We can succeed only by concert. It is not 'can any of us imagine better?' but 'can we all do better?' The dogmas of the quiet past are inadequate to the stormy present. The occasion is piled high with difficulty, and we must rise with the occasion. As our case is new, so we must think anew, and act anew. We must disenthrall ourselves, and then we shall save our country."

We should—all of us—no matter our perspective or experience—disenthrall ourselves from bias and ideology to find a new path forward.

Our future depends on how well we find this path together.

We know you share this view and look forward to this morning's hearing.

The CHAIRMAN. Governor, we are at 7 minutes, and I know the Senators want to ask you questions.

Governor HICKENLOOPER. Sure.

The CHAIRMAN. Would you like to wrap up?

Governor HICKENLOOPER. Yes. I was at that point right there just saying that as long as we can maintain a focus on science-based applications and make sure we have the competing interest at the table, I think that we'll be able to continue the pursuit of these innovations.

The CHAIRMAN. Well said.

Mr. Liveris.

STATEMENT OF ANDREW N. LIVERIS, CHAIRMAN AND CHIEF EXECUTIVE OFFICER, THE DOW CHEMICAL COMPANY, MIDLAND, MI

Mr. LIVERIS. Thank you Mr. Chairman, Senator Murkowski, distinguished members of the committee.

Senator Stabenow, thank you for that great introduction.

I'm Andrew Liveris now and that can go on the public record. Thank you here for inviting me here to celebrate our democracy in the intersection of government, business, and civil society practiced in this chamber under your leadership.

Your collective leadership is something an individual like me, as a foreigner living in this great country, does not take lightly.

Thank you very much for inviting us to talk about this important conversation.

As already stated, it has the promise of tapping this vast new natural gas resource and coming up with a better answer.

This is being called the Shale Gale.

It's afforded America a new competitive advantage, advantages which we now are becoming quite familiar with.

But it does pose us with these challenges, and I believe that our democracy can rise to the better answer by having these conversations.

How much of this natural bounty should we export?

I'm here because the answer is neither simple nor just obvious. It actually isn't either binary. It's not binary to talk about a neither-nor proposition here. It's not binary to talk about for or against free trade.

As you know, the Shale Gale has only fueled the increases in natural gas production—not only done that, but it's provided this manufacturing renaissance.

For companies like Dow, the compounds that make up natural gas, as already stated by Senator Stabenow, are the feedstocks for vital manufacturing processes that create value across the entire economy.

We use them as the first indispensable ingredient for everything that is made and consumed in this country.

So when natural gas is not sold just as an export, when it's used instead as a building block for these manufactured goods, it creates 8 times more value across our entire economy—8 times.

In this way, America's natural gas bounty is more than a simple commodity. It's a once in a generation opportunity for America to export advanced products, not just be to use.

It's a unique opportunity to make America's economy stronger, more balanced, more sustainable.

This is not to say that America ought to keep all of this gas onshore'not at all.

Exports are part of America's economy. It's one of the life bloods of America's economy and the world's economy.

The U.S. should lead in both the sale and shipment of the raw material and the finished goods.

But the fact is if we shipped half or more of this bounty overseas today, as some propose, it'll have severe, unintended consequences on the manufacturing and the sector inside the United States on prices.

Not just domestic companies, because we're going to have to compete with whatever's left over. Not just the effect on us.

It would actually mean higher gas and electricity prices.

It'll mean actually higher transportation and utility costs for consumers, as well as industry.

These higher and more volatile energy prices would also cause domestic energy producers to once again to ship operations and to ship jobs overseas to ship factories overseas to countries where natural gas is cheaper.

There are countries where natural gas is cheaper.

America would sacrifice this once in a generation competitive advantage because gas is not an openly traded commodity.

It is not and therefore does not have a world price.

European and Asian natural gas prices are actually indexed directly to oil price, which makes them up to 5 times more expensive than in the United States.

So it's very easy to see why other Nations want our gas. They want to lower their prices.

What's harder to see is why would we be willing to do that at such a potentially severe cost to the American consumer and the American industry.

Globally, we need to continue our progression to rules-based free trade, especially for gas.

Domestically, we need to choose a more prudent, responsible, balanced approach, an all-of-the-above approach.

This is now, in our view, a pressing issue.

As you're aware, the Natural Gas Act requires the Department of Energy to weigh the public interest in evaluating applications to export liquefied natural gas.

Today, they are considering 12 such applications that taken together would permit exports equal to half of today's U.S. production, in effect exporting our competitive advantage away and importing the world oil price for our domestic sector.

Our view is that DOE should thoroughly examine each and every one of these applications to see what it is on its merits.

Regulators should consider a full array of criteria, should weigh the impact on everything from food prices to home heating bills to jobs and job creation.

Let me be particularly clear. We're not asking lawmakers to ignore the interests of any stakeholder to the contrary.

We believe that everyone affected by DOE's decisions should be part and have a voice in informing these choices.

If we make these decisions cautiously and incrementally, if we measure the effects of our decisions and adjust our actions accordingly, then we can achieve not just a win-win, but a quadruple win, and believe you me, I really see a quadruple win—really in the world of business.

Firstly, energy producers can win. Energy producers can win like those in Alaska because they explore and export more.

Second, manufacturers win because they, in fact, access these fuel and feedstocks at stable, not volatile prices set by some world oil cartel.

Third, the American people win. They win because they will see, not just see the huge spikes in utility bills and home heating bills like we did a decade ago, but actually will see lower costs and create more jobs for the American consumer.

Last the U.S. economy wins. The U.S. economy wins because it'll become advantaged and competitive, better balanced, better insulated from price shocks and volatility, more resilient and more robust.

So the question in front of us, can we do all of this and act in the public interest?

This year is only the 4th or 5th year of a 100-year advantage. We have the time.

Let's take the time.

Let's get this intersection right.

Let's manage this with prudence and caution in the public interest.

Let's do it in the interest of American workers, American consumers, American industry, American producers.

Let's put America first. We should all share that goal.

I thank you for the opportunity to discuss it.

[The prepared statement of Mr. Liveris follows:]

PREPARED STATEMENT OF ANDREW N. LIVERIS, CHAIRMAN AND CHIEF EXECUTIVE OFFICER, THE DOW CHEMICAL COMPANY, MIDLAND, MI

The Dow Chemical Company appreciates the opportunity to submit these written comments to the Committee on Energy and Natural Resources. Dow is committed to sustainable market-based approaches that further the national interest and competitiveness of the United States.

We applaud the Committee for holding a hearing on opportunities and challenges for natural gas. With forward-looking government policy, the shale gas revolution presents a once-in-a-lifetime opportunity for the country to further critical national goals like economic growth, job creation and investment, energy security and independence.

About Dow

Dow was founded in Michigan in 1897 and is one of the world's leading manufacturers of chemicals, plastics and advanced materials. Dow combines the power of science and technology to passionately innovate what is essential to human progress. Dow connects chemistry and innovation with the principles of sustainability to help address many of the world's most challenging problems such as the

need for clean water, renewable energy generation and conservation, and increasing agricultural productivity. Dow's diversified industry-leading portfolio of specialty chemical, advanced materials, agrosciences and plastics businesses delivers a broad range of technology-based products and solutions to customers in approximately 160 countries and in high growth sectors such as electronics, water, energy, coatings and agriculture. More information about Dow can be found at www.dow.com.

Dow is a major user of natural gas and natural gas liquids (NGL), both as an energy source and as feedstock for production of our products. Consequently, we have vast experience that can help inform development of thoughtful, constructive policies on the availability and consumption of natural gas. Natural gas plays a critical role in the U.S. economy, energy policy and the global competitiveness of the United States. In this submission, we will discuss our views on government policies that impact natural gas and the effect of those policies on U.S. competitiveness.

Dow uses natural gas to drive the chemical reactions necessary to turn our feedstocks into useful products, many of which lead to net energy savings. Dow's global hydrocarbon and energy use amounts to the oil equivalent of 850,000 barrels per day, approximately the daily energy use of Australia.

Notwithstanding the challenges of being an energy-intensive manufacturing company, Dow has continually improved its energy and environmental performance, including limiting greenhouse gas emissions, and we are committed to continuous improvement moving forward. Our manufacturing energy intensity, measured in British thermal units (BTUs) per pound of product, has improved more than 40% since 1990, saving the company more than $24 billion and 5,200 trillion BTUs. Our 2015 sustainability goals, available at www.dow.com/sustainability/, underscore our energy, climate and other commitments.

As both a consumer and an innovator in energy efficiency and renewable energy technologies, Dow represents a company that believes in an "all of the above" energy policy. As important as the promise of natural gas is, we cannot call upon a single fuel source to do everything we are asking of it.

Manufacturing renaissance

Natural gas is essential for American industry, and growth in shale gas production has been a bright spot for the U.S. economy. Natural gas is an essential component in thousands of everyday consumer products such as cars, appliances, paper, steel, plastic products, pharmaceuticals, and in fertilizer for our farms, in addition to providing heat, hot water, cooking and electric power to tens of millions of residential consumers.

Manufacturing in the United States is undergoing a renaissance, facilitated in substantial part by reasonable and stable natural gas prices. For the first time in over a decade, domestic manufacturers in multiple industries, including petrochemicals, fertilizers, glass, aluminum and steel, are planning to invest in production facilities in the United States. Over 100 new projects have been announced so far, representing approximately $95 billion in new investments. According to Boston Consulting Group, natural gas price reductions could lead to the addition of approximately 5 million manufacturing jobs. This manufacturing renaissance was unimaginable but a few short years ago.

Dow alone is investing about $4 billion in new U.S. facilities that will create thousands of new American manufacturing jobs. The outlook for affordable U.S. natural gas was a significant factor behind our decision to invest on this scale in facilities on the U.S. Gulf Coast. To a great extent, continuing optimism for U.S. manufacturing is founded on the prospect of an adequate, reliable and reasonably priced supply of natural gas.

In and of itself, manufacturing is a critical part of a growing, diversified economy and a major job creator. Beyond that, however, benefits from a strong manufacturing sector ripple throughout the American economy by creating jobs and increasing investments and spending on research and development. For example:

- Each job created in the manufacturing sector leads to at least five more jobs in the larger economy.
- Each job in petrochemical manufacturing creates at least eight more jobs in the larger economy.
- Industrial manufacturing creates $8 of value in the larger economy for every $1 of natural gas consumed. The manufacturing sector contributes a higher value added multiplier to the economy than any other sector or any other use of natural gas.
- Manufacturing firms drive innovation by conducting two-thirds of U.S. research and development.

For these reasons, plentiful and affordable natural gas represents a tremendous competitive advantage for American industry. It would be misguided to take actions that threaten this advantage.

Natural gas supply and demand in context

As with any other commodity, the supply of and demand for natural gas determine its price, and the balance between the two is affected by governmental policies. At the same time, U.S. manufacturers are particularly sensitive to natural gas price fluctuations. As natural gas prices rise, manufacturers are more likely than other sectors of the economy to reduce their consumption.

Because of this relatively high demand elasticity, manufacturers tend to serve as "shock absorbers" for the economy when natural gas prices rise. They cut consumption of natural gas, which reduces demand and mutes price volatility for others.

Gas price increases undermine manufacturing jobs. The United States enjoyed relatively stable natural gas prices from the 1970s to around 2000. Between 2000 and 2009, however, U.S. industrial gas demand fell 24% as prices rose to highs of almost $14.50/MMBtu from a base of roughly $3.50/MMBtu. Job losses in the manufacturing sector totaled approximately 5.4 million between 2000 and 2009, and volatile natural gas prices were a significant factor. Manufacturing's high demand elasticity also means that governmental policies that tend to encourage upward pressure on natural gas prices affect manufacturers more than other sectors.

Utilizing natural gas domestically would enhance employment and value added throughout the economy. As demonstrated in the chart below*, the effect of deploying 5bcf/day of natural gas in the domestic manufacturing sector would be an increase of $4.9 billion in the national value added (GDP) and a manufacturing employment increase of 180,000 jobs, both directly and through the supply chain.

In stark contrast, exporting that same 5bcf/day of natural gas overseas as liquefied natural gas (LNG) would lead to a GDP increase of only $2.3 billion and an employment increase of only 22,000 jobs. Moreover, even within the construction sector the payoff from using natural gas domestically far exceeds the benefits of exporting LNG, as the plant-building construction activity associated with increasing the supply of natural gas to energy intensive, trade exposed industries is more than four and one-half times greater than the construction activity associated with LNG exports.

Shale gas production has created a short-term focus on expanded supply and the effect of that supply on market clearing prices. We believe that focus is misplaced because very few policy-making and investment decisions have an impact over such a short time horizon. Instead, investment and policy-making should be focused on both the medium-and long-term outlook for natural gas.

In the medium-and long-term, domestic natural gas demand growth is expected to be driven by several factors, including:

- The policy-driven shift in electricity production from coal to natural gas,
- Increased investments by industry, which uses forty percent of the nation's natural gas and gas-produced electricity, and
- Increasing numbers of truck and fleet vehicles that use natural gas in lieu of conventional motor fuels.

Companies in the manufacturing, transportation and utility sectors are already making investment decisions based on today's competitive prices and the outlook for affordable and stable natural gas into the future. These decisions will play out over the next ten to twenty years. Our assessments indicate that demand for U.S. natural gas may increase by approximately 60 percent above current levels by 2035. An important corollary question is whether supply can possibly keep up with this new demand.

Sound policy attracts investments and creates jobs

Federal policies on environmental regulation, transportation, electric generation, exports and taxes will have a major impact on natural gas supply and demand, which in turn will have a decisive effect on business investment and job creation for manufacturers. Dow supports policies that stimulate economic growth by facilitating adequate and reliable natural gas supplies at reasonable prices. Congress should be circumspect about policies that could disrupt natural gas supply and pricing, such as:

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*All charts have been retained in committee files.

- Policies that focus consumption on one fuel source or that artificially accelerate demand ahead of supply, such as regulations that encourage rapid replacement of coal fired power plants with natural gas power plants.
- Bans or unreasonable limitations on recovering natural gas and oil through hydraulic fracturing.
- Exporting LNG without a thorough and inclusive process for evaluating the implications for domestic supply and demand, costs to consumers and manufacturers, jobs and economic growth.

Advances in hydraulic fracturing have spurred shale gas supply abundance. Hydraulic fracturing technologies have existed for decades, but recent innovation has made it possible to more economically recover natural gas from shale deposits. While these advances have expanded the supply of natural gas, regulatory authorities at the federal and state levels are scrutinizing the environment effects of this production technology. Dow believes that hydraulic fracturing can be done in a safe and environmentally responsible way. But overly restrictive environmental regulations or moratoria on hydraulic fracturing could greatly reduce future supplies of natural gas, which would have a dramatic impact on the manufacturing sector. A governmental policy that incentivizes use and discourages production is a recipe for higher prices.

Likewise, federal and state regulation of electricity generation could affect demand for natural gas. In the power generation sector, a transformation is underway as utilities and merchant generators switch from predominantly older coal-fired power plants to newer, more efficient natural gas-fired generation. The low price of natural gas is driving some of these changes. Because natural gas power plants emit fewer greenhouse gases than do coal plants, however, several environmental policies, both enacted and proposed, would also encourage fuel switching.

Over the last few years, Congress has considered legislation that would establish a clean energy standard for domestic power generation or that would tax carbon emissions. Such a standard would affect resource allocations and would credit sources of generation that are cleaner than coal. Under some policies, natural gas-fired generation would qualify for this treatment. We urge caution in considering policies that encourage fuel switching between natural gas and coal: electricity producers are already choosing to add gas-fired generation without these additional regulations. Unlike power generation, which can rely on other sources such as nuclear, hydro, wind, solar, biomass, demand response or efficiency measures to meet capacity requirements, homeowners, farmers and the industrial sector do not always have economic alternatives to natural gas.

EPA rulemakings have increased the cost of owning and operating coal-fired power plants. Each of these policies will have the effect of increasing demand for electric generation from natural gas-fired power plants, which will put upward pressure on natural gas prices. Such policies should be designed to avoid precipitously tipping the supply/demand balance in a way that causes volatility in natural gas prices.

Tax policy also affects supply of and demand for natural gas. For example, as part of recent negotiations, some lawmakers have also proposed limits on certain tax incentives that encourage oil and gas exploration and production. Tax policymaking should account for the potential impact of policies on the availability and affordability of natural gas.

As these examples show, government policies may profoundly impact natural gas supply and demand, and thus, the manufacturing sector. At Dow, we understand that forward-looking, thoughtful public policy is a necessary part of addressing the challenges that confront the United States today. At the same time, these policies should also focus on renewing and sustaining our newfound American manufacturing advantage, which we believe is critical to ensuring continued economic and job growth in the United States and overall U.S. competitiveness.

Export licensing

Over 70 years ago, Congress recognized that the import and export of natural gas, a finite natural resource, can have critical implications for U.S. prosperity. In the Natural Gas Act, Congress charged the executive branch with regulating the import and export of natural gas in accordance with the public interest.

The Department of Energy (DOE) has extensive experience evaluating import applications, but it has had limited experience with export applications. Perhaps not surprisingly, there are no clearly established criteria for DOE to apply in determining the public interest with regard to natural gas exporting.

Dow supports expanded exports and trade. However, we also believe it is crucial that DOE have the information and analysis necessary to properly apply the Natural Gas Act requirement that exports be consistent with the public interest. We

applaud DOE's recent acknowledgement that an economic study that it commissioned is but one data point in the broad array of considerations that are relevant for a public interest determination. In short, Dow supports an approach to such determinations by DOE that is based on objective criteria and metrics, established through a public process and applied on an incremental, case-by-case basis in a consistent and balanced manner.

Today, DOE is considering 16 applications to export LNG. Since the proposed importing countries do not have a particular type of free trade agreement (FTA) with the United States, these applications are not covered by the statute's presumption that an FTA represents a determination that the application meets the public interest test. After approving one such application, DOE has temporarily suspended the processing of "non-FTA" LNG export applications. Implicitly recognizing that more is at stake than can be resolved through its traditional approach to processing export applications, DOE commissioned a report from a private firm to evaluate the macroeconomic effects of higher LNG exports.

As detailed in Dow's January 24 submission to DOE[1], this consultant report is fundamentally flawed and underestimates the potential harmful effects of sharply higher LNG exports. More broadly, though, commissioning the report should be the first step in developing policies that will enable DOE to administer appropriate public interest determinations for LNG export applications. No economic study can account for the full profile of U.S. values that should inform a determination of the public interest with regard to natural gas exports.

The outstanding authorization requests present what is essentially a new challenge. In the modern era, the U.S. government has not faced the need to determine the public interest in connection with requests to authorize exports of large volumes of natural gas. This Committee should encourage DOE to continue its effort to improve the process for evaluating LNG export applications by providing an opportunity for all affected constituencies and the public at large to comment on how best to assess the public interest as it pertains to exports of natural gas.

Newly discovered sources of natural gas present a great opportunity for the United States. At the same time, natural gas remains a finite natural resource with important implications for U.S. energy security, energy independence and the environment. Exports can have supply and price effects that have major impacts throughout the country. The economic impact of LNG exports is also likely to vary by geographic region and by business center. Consequently, public interest determinations should be thorough enough to evaluate nation-wide implications of LNG exports as well as localized effects.

Unchecked LNG export licensing can cause demand shocks, and the resulting price volatility can have substantial adverse impacts on U.S. manufacturing and competitiveness. In the recent past, the price of natural gas was very high and volatile until the advent of substantial shale gas production. Gas supplies and demand are inherently difficult to predict accurately. Thus, Dow urges a cautious, considered, comprehensive and deliberate approach to assessing the public interest.

Currently, DOE regulations provide for the adjudication of LNG export applications on a case-by-case basis in proceedings that depend on the parties to raise issues relevant to a public interest determination and to support their positions with persuasive evidence. DOE interprets the Natural Gas Act's public interest standard as creating a rebuttable presumption that a proposed export of natural gas is in the public interest. This means that DOE is to approve an application unless those who oppose the application can overcome this presumption.

In its principal order to date authorizing exports of LNG to non-FTA countries, DOE identified certain topics as being relevant to its evaluation of the impact of LNG exports on the public interest:

- the domestic need for the natural gas proposed to be exported,
- whether proposed exports threaten the security of domestic natural gas supplies, and
- any other issue DOE deems to be important, including whether the export arrangement is consistent with DOE's policy of promoting competition in the marketplace by allowing commercial parties to freely negotiate their own trade arrangements.[2]

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[1] Dow's submission is available at http://www.fossil.energy.gov/programs/gasregulation/authorizations/export study/peter molinario em01 24 13.pdf.

[2] We are encouraged that the Deputy Secretary of Energy recently acknowledged to the Chairman of this Committee that a variety of other topics merit evaluation in connection with LNG export application public interest determinations.

The topics that DOE has identified for evaluating the public interest are too narrow and vague to capture all of the critical national, regional and local issues at stake with LNG exports or to offer any useful guidance. In response to the economic study it commissioned, DOE has received more than 370 submissions from a broad array of stakeholders covering an equally broad array of topics. The sheer number of submitted comments reflects the depth of interest regarding this issue. Unfortunately, the current process provides no assurance that DOE will consider all aspects of the public interest in any given proceeding. This is inevitable for an administrative process that depends on arguments and evidence submitted by the parties to a specific export application process. These parties are representing their specific interests, and may not adequately represent the totality of the public interest.

A timely DOE rulemaking process to formulate criteria for determining the public interest as it relates to LNG exports could ameliorate some of the shortcomings of the current process. All of the major constituencies affected by LNG exports should have an opportunity to be heard, which could enable DOE to obtain much broader public input and do so efficiently in a single forum. This would increase the likelihood that all relevant considerations will be identified and that cumulative and national effects will be addressed as well as regional effects. The result of such a rulemaking process-establishment of uniform and actionable criteria with measurable metrics-would facilitate balanced, comprehensive consideration of the public interest by DOE, give parties in individual proceedings advance notice of many of the most relevant considerations, and reduce the risk of inconsistent adjudications across applications. DOE would then apply these criteria and metrics incrementally over time in individual application proceedings, which would assure fairness and uniformity, while allowing DOE to consider changes in circumstances from one application to the next.

More importantly, DOE could adopt a mechanism to balance, in the aggregate, exports and U.S. interests that inform the public interest. A new rule of this kind should generally ensure that DOE is presented with adequate and accurate evidentiary records in each licensing proceeding.

While criteria for determining the public interest should be developed as part of the rulemaking described above, we believe the list below provides a good starting point for identifying specific, concrete and forward-looking criteria that DOE should evaluate in connection with LNG export applications:

- Domestic manufacturing—How will exports impact natural gas prices and the supply/demand balance? Will natural gas supply be reduced? Will there be less feedstock for announced investment projects? Will the jobs created by increased exports exceed jobs lost by the manufacturing industry? Will additional exports displace U.S. consumption?
- U.S. consumers—Will exports reduce the supply of natural gas available for utilities or affect consumer prices or energy costs? Will utilities decrease fuel switching to natural gas?
- Energy security—Will exports reduce the volume of natural gas available for domestic use or increase the need to rely on imported petroleum?
- Employment—How many new jobs will be created or existing jobs impacted? Are employment gains in the oil and gas sector offset by job losses in other areas of the economy affected by relatively higher natural gas prices?
- International trade—Will exports improve the U.S. balance of trade payments sufficiently to offset falling exports in other value-adding sectors of the economy? As to proposed exports to FTA countries, are the exports destined for consumption in the FTA country or will there be transshipment of natural gas to non-FTA countries? How can export applications be disposed of in a manner consistent with U.S. trade obligations?
- Environmental—What would the proposed exports' environmental impact be?
- Strategic interests—Will the exports support a strategic American ally in a meaningful way and consistent with stated policy priorities? Do proposed importing countries accord the United States reciprocal favorable international trade treatment? What are the implications for any current or proposed FTA negotiations?
- Price and volatility—How is the LNG contract being priced, and is it linked to oil in some manner? What is the expected short and long term impact on natural gas and electricity price volatility?
- Other regulatory impacts—What is the potential impact of other regulatory decisions on natural gas demand or supply and what is the interplay between those impacts and exports of natural gas?

DOE should apply criteria that result from this rulemaking to applications on a case-by-case basis and in an incremental fashion. This would entail evaluating

whether approving each individual application is in the public interest, and whether the incremental impact of approving that application, in light of DOE's prior approvals, would be consistent with the public interest. Again, the last ten years have seen great fluctuations in domestic gas prices, and circumstances can change as drilling techniques are improved, sources of consumption are expanded or the condition of the economy evolves.

Forward thinking public policy can spur American industry

At Dow, we are implementing a comprehensive plan to take advantage of the structural change that has occurred in the natural gas market, a market that we believe is working. Indeed, we have announced plans to invest in American plants based on our belief that natural gas will remain affordable for American industry and consumers. We are not alone in our desire to expand our American footprint and create thousands of new American manufacturing jobs.

Forward-thinking policy is essential for maintaining this momentum. Dow wishes to support U.S. officials at all levels of government to realize a shared vision of affordable natural gas continuing to revitalize American manufacturing and enhancing U.S. competitiveness. We are in year four or five of a 100 year energy advantage, and a thoughtful, prudent approach to policy-making can ensure that we can leverage the competitive advantage to the benefit of all Americans. The country deserves no less.

We appreciate the opportunity to submit this statement. For more information on Dow and our energy plans visit www.dow.com/energy/perspectives.

The CHAIRMAN. Very good. America first-sums it up.

Mr. Eisenberg, welcome.

STATEMENT OF ROSS EISENBERG, VICE PRESIDENT, ENERGY AND RESOURCES POLICY, NATIONAL ASSOCIATION OF MANUFACTURERS

Mr. EISENBERG. Thank you Chairman Wyden. Good morning. Good morning Chairman Wyden, Ranking Member Murkowski, and members of this committee. My name is Ross Eisenberg. I'm vice president of Energy and Resources Policy for the National Association of Manufacturers.

The NAM is the Nation's largest industrial trade association, and we represent nearly 12,000 small, medium, and large manufacturers in nearly every industrial sector and in all 50 States. Now manufacturers are major energy consumers. We use about 1/3 of the energy consumed in the United States. So for manufacturers, natural gas is a critical component of an all-of-the-above energy strategy that embraces all forms of domestic energy production, including oil, gas, coal, nuclear, energy efficiency, alternative fuels, and renewable energy sources.

Thirteen years ago, or sorry, 13 months ago, PricewaterhouseCoopers, with support from the NAM, released a report called Shale Gas, a Manufac-Renaissance in U.S. Manufacturing, and that report found that full-scale and robust development of U.S. shale gas plays could lead to 1 million new manufacturing jobs by the year 2025. Now that's just manufacturing jobs by 2025. In addition, lower feedstock and energy costs could help manufacturers reduce manufacturing gas expenses by as much as $11.6 billion annually in that same timeframe. PWC's predictions are very quickly becoming a reality. Some are calling it the reindustrialization of America. Almost weekly, we're seeing companies announce new ventures and facilities to manufacture iron, steel, fertilizer, chemicals, plastics, acrylic rosins, diesel fuel, and a wide range of other energy-intensive products.

There's really no better example of the impact that natural gas is having than the announcement last year by a Canadian manufacturer that it plans to actually take apart a working methanol plant in Chile and move it to Senator Landrieu's State of Louisiana.

The natural gas boom has provided major opportunities to manufacturers across the supply chain. Manufacturers design and construct the drilling facilities, supply machinery and materials for hydraulic fracturing and well completion, and they provide needed infrastructure like pipelines, compression stations, storage facilities, and processing facilities. All of this new activity will require roads and bridges which, in turn, require concrete, brick, gravel, and steel. Drilling sites will need vehicles, fuel, and significant water supplies, which will need to be supplied, transported, and treated, all by manufacturers.

Downstream, the possibilities from chemicals to windows to toys to electricity are truly endless.

But let's not kid ourselves here. None of this is going to happen if we can't get the natural gas out of the ground. We've got plenty of natural gas, and we believe the free market can generally resolve any disputes over how the gas should be used.

But if the Federal Government takes an overly prescriptive or reactive approach to permitting, to regulation, or to exports, than our natural gas field manufacturing renaissance will be over quicker than it began.

That is the NAM's message to the committee today. If we truly want to create 1 million new manufacturing jobs by 2025, we should be encouraging the responsible development of natural gas, balanced by reasonable State-based regulation, a manageable permitting process, and a free market approach to potential exports.

If that happens, we can all be winners.

States have long been the primary regulators of hydraulic fracturing, and the NAM believes that it should stay that way. Governor Hickenlooper's testimony today shows that State governments are up to the challenge. Where there's a perceived efficiency in any one State's regulatory mechanisms, the Federal Government should work with the State to fill in those gaps rather than applying a one-size-fits-all Federal rule on States like Colorado where really no deficiencies exist.

The NAM was founded in 1895 on principles of free trade. With respect to LNG exports, the NAM fundamentally supports free trade and open markets and opposes bans or similar market destroying barriers to exports of natural gas or any other commodity.

The NAM is not calling for policies that favor LNG exports over the use of natural gas domestically nor are we calling for the opposite. What we're calling for is for the free market to be allowed to work.

The NAM encourages the cost effective use of natural gas to grow American manufacturing and believes in a natural gas policy that is open—a process that is open, transparent, and objective, and we urge policymakers to rely on the best quality of information regarding the impact of LNG exports on economic, environmental, and national security interests.

Finally, the long and complex and often unmanageable permitting process remains a major obstacle, if not the major obstacle, to full and robust development of our Nation's energy resources. For instance, the average time to complete an environmental impact statement, under the National Environmental Policy Act, takes an average of 3.4 years and that gets longer by 37 days with each passing year. The developer can then be sued for 6 years after a final determination is made.

Manufacturers really must be able to depend on a predictable, reliable, and efficient permitting process. The NAM believes strong actions must be taken to streamline the permitting process for energy projects before it is too late.

To conclude, with the right energy policies in place, manufacturers can experience a true resurgence. Robust development of our Nation's vast natural resources—natural gas resources will help drive domestic manufacturing as a critical component of a true all-of-the-above energy strategy.

The NAM stands ready to support the committee's efforts to promote natural gas development and the manufacturing jobs that it will provide.

Thank you very much for the privilege of testifying today. I look forward to any questions.

[The prepared statement of Mr. Eisenberg follows:]

PREPARED STATEMENT OF ROSS EISENBERG, VICE PRESIDENT, ENERGY AND RESOURCES POLICY, NATIONAL ASSOCIATION OF MANUFACTURERS

Good morning, Chairman Wyden, Ranking Member Murkowski and members of the Senate Committee on Energy and Natural Resources. My name is Ross Eisenberg, and I am vice president of energy and resources policy at the National Association of Manufacturers (NAM). I am pleased to share the NAM's views on the importance of America's natural gas resources and the vital role they can play for manufacturing, jobs and the economy.

The NAM is the nation's largest industrial trade association, representing nearly 12,000 small, medium and large manufacturers in every industrial sector and in all 50 states. Manufacturers are major energy consumers, using one-third of the energy consumed in the United States. For manufacturers, natural gas is a critical component of an "all-of-the-above" energy strategy that embraces all forms of domestic energy production, including oil, gas, coal, nuclear, energy efficiency, alternative fuels and renewable energy sources.

The United States has a mix of energy resources and innovative technologies unmatched by any other nation in the world. The United States is the "Saudi Arabia of coal" and has for years relied on its dominant coal reserves for baseload power generation; more than 100 nuclear power plants cleanly and efficiently produce a substantial portion of the nation's electricity; renewable sources are growing quickly and diversifying the nation's energy portfolio; and advances in energy efficiency continue to cut manufacturers' energy costs. Most recently, technological breakthroughs have made vast domestic deposits of oil and gas cheaply and easily accessible, offshore and onshore. What was once a potential weakness has become a major strength for manufacturers.

Natural Gas—Fueling Growth in the Manufacturing Sector

The natural gas boom has provided major opportunities for manufacturers across the supply chain. Upstream, manufacturers design and construct drilling facilities; supply machinery and materials, such as cement and steel for hydraulic fracturing and well completion; and perform a wide range of support activities and services for the natural gas extraction process. Midstream, manufacturers provide needed infrastructure, such as pipelines, compressor stations, storage facilities and processing facilities. And downstream, the possibilities-from chemicals to windows to toys to electricity-are truly endless.

The natural gas manufacturing supply chain extends even further. All of this new activity will require roads and bridges, which, in turn, requires concrete, brick, grav-

el and steel. Drilling sites will need vehicles, fuel and significant water supplies-which will need to be supplied, transported and treated. Site employees will need uniforms, and those uniforms will need to be cleaned and maintained. The list goes on and on.

As more natural gas is recovered, domestic manufacturers gain a substantial cost benefit relative to their international competitors. Thanks to newfound supply and price stability, manufacturers in the United States enjoy natural gas prices considerably lower than in China, India, Brazil, Japan and the United Kingdom.[1] This is a very important point, since the NAM estimates that due to domestic tax, tort and regulatory policies, it is 20 percent more expensive to manufacture in the United States than in any of its nine largest trading partners-and that excludes the cost of labor. Manufacturers in the United States enjoy a slight competitive advantage regarding energy, and with the right policies, this advantage can grow.

In December 2011, PricewaterhouseCoopers (PwC), with support from the NAM, released the report Shale Gas: A renaissance in US manufacturing?[2] PwC's study examined what a growing shale gas industry could truly mean for manufacturing job creation in the United States. The results are impressive: PwC found that full-scale and robust development of U.S. shale gas plays could result in 1 million new manufacturing jobs by 2025. In addition, lower feedstock and energy costs could help manufacturers in the United States reduce natural gas expenses by as much as $11.6 billion annually in that same time frame. Chemical manufacturers had been the largest beneficiaries of this new abundance of natural gas, owing primarily to less expensive ethane, a natural gas liquid derived from shale gas. PwC identified Bayer Corporation, Chevron Phillips Chemical Company, Formosa Plastics Corporation and Westlake Chemical Corporation as companies taking early advantage of the shale gas boom.

PwC found that the benefits of shale gas for manufacturers were not limited to the major natural gas users; the benefits extended throughout the supply chain. According to PwC, companies that sell goods, such as metal tubular products and drilling and power equipment, were likely to experience near-term growth in sales as domestic natural gas production rates increased. PwC identified projects by U.S. Steel and Vallourec Ohio intended to supply steel pipe and related materials for shale gas extraction activities. These higher production levels would also yield benefits higher in the value chain, such as manufacturers of components used in drilling equipment. Overall, PwC found that 17 chemical, metal and industrial manufacturers commented in SEC filings in 2011 that shale gas development drove demands for their products, compared to none in 2008.

In the 13 months that have passed since PwC released its study, the impact of new supplies of natural gas on manufacturing has become even more pronounced. Nucor embarked on plans to develop a $750 million iron facility in Louisiana and announced a $3 billion joint venture with Canadian oil and gas producer Encana for 20 years of access to its natural gas wells.[3] Mitsubishi announced plans to build an acrylic-resin processing plant adjacent to a newly constructed ethylene plant.[4] Fertilizer manufacturer CF Industries announced that it will spend $2.1 billion to expand its fertilizer manufacturing operations.[5] Formosa Plastics Corporation increased the size of its Texas ethylene plant included in the 2011 PwC[6] report. Even foreign manufacturers are now seeking to build operations in the United States. Austrian steel manufacturer Voestalpine AG announced in late 2012 it plans to build a $661 million steel factory in the United States.[7] South African energy company Sasol announced plans to construct America's first commercial gas-to-liquids

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[1] "Shale Gas Will Fuel a U.S. Manufacturing Boom," MIT Technology Review, Jan. 9, 2013, available at http://www.technologyreview.com/news/509291/shale-gas-will-fuel-a-us-manufacturing-boom/.

[2] Available at http://www.pwc.com/us/en/industrial-products/publications/shale-gas.jhtml.

[3] "Encana, Nucor report joint Piceance basin gas drilling program," Oil & Gas Journal, Nov. 9, 2012, available at http://www.ogj.com/articles/2012/11/encana-nucor-report-joint-piceance-basin-gas-drilling-program.html.

[4] "Mitsubishi Chemical to build $710 million U.S. plant, eyes shale gas cost savings," Reuters, Dec. 23, 2012, available at http://www.reuters.com/article/2012/12/23japan-usa-mitsubishichemical-idUSL4N09X05Z20121223.

[5] "The new boom: Shale gas fueling an American industrial revival," The Washington Post, Nov. 14, 2012, available at http://articles.washingtonpost.com/2012-11-14/business/35506130_1_natural-gas-shale-cf-industries.

[6] "Formosa Plastics U.S.A. Will Invest US$1.7 B. in Expansion," CENS, Dec. 14, 2012, available at http://cens.com/cens/html/en/news/news_inner_42344.html.

[7] "Shale-Gas Revolution Spurs Wave of New U.S. Steel Plants," Bloomberg, Dec. 31, 2012, available at http://www.bloomberg.com/news/2012-12-31/shale-gas-revolution-spurs-wave-of-new-u-s-steel-plants-energy.html.

plant in Louisiana, an $11 billion-$14 billion venture.[8] Egyptian fertilizer manufacturer Orascom Construction Industries plans to build a $1.4 billion nitrogen fertilizer production plant in Wever, Iowa.[9] Canadian methanol producer Methanex announced in 2012 that it will dismantle a methanol plant in Chile and move it to Ascension Parish, Louisiana.[10] BlueScope Steel Limited, an Australian company, is building a steel factory in Ohio in partnership with U.S. manufacturer Cargill.[11] And Indian manufacturer Essar Global Limited is planning a steel facility for Minnesota.[12]

Last June, a report by independent global energy research firm IHS CERA predicted that the share of U.S. natural gas produced from unconventional sources will reach 67 percent by 2015 and 79 percent by 2035[13]. This would lead to $3.2 trillion in investments to develop the resource and 1.4 million new jobs (on top of the 1 million already created by the industry). These economic benefits are not limited to gas-producing states; non-gas-producing states contributed 18 percent of the total U.S. employment generated by unconventional gas activity in 2010. IHS CERA concluded that increased unconventional gas activity will contribute to capital investment, job opportunities, economic growth, government revenue and lower prices across the country.

Opportunities and Challenges for Natural Gas Development

This newfound natural gas renaissance has brought with it increased scrutiny from our nation's capital. With increased scrutiny comes a host of policy-related issues, from debates over how best to use this valuable new resource to the need for federal oversight and regulation.

1. Federal Regulation

Whether and how the federal government plans to regulate shale gas continues to pose a major concern for manufacturers. By early 2012, no fewer than 12 federal agencies were considering some form of oversight or regulation of the practice of hydraulic fracturing. The NAM brought this issue to the White House, and in response, President Obama issued an Executive Order in April 2012 requiring federal agencies to better communicate and coordinate with one another.[14] The pace of federal oversight appears to have slowed, but there are still a number of regulations under development. There is no easier way to limit the job-creating potential of natural gas to manufacturers than to lump so many costly, time-consuming regulations onto the drilling process that the gas never gets out of the ground.

One regulation that greatly concerns manufacturers is the pending disclosure and well stimulation rule under development at the Bureau of Land Management (BLM). The BLM performed a cost-benefit analysis for the proposed regulation, and under virtually every scenario modeled, the rule's costs outweighed its benefits. The BLM recently announced that it has revised the rule and will issue a new proposal for public comment. The NAM is cautiously optimistic that the BLM will fix the rule, which an economic analysis by John Dunham & Associates for the Western Energy Alliance found would cost $1.615 billion for new and existing wells in the 13 western states that contain the preponderance of the nation's federal and Indian lands. The regulation would impact an estimated 5,058 wells waiting to be permitted or drilled. The study found that Wyoming would see the biggest cost impact from the proposed rule, with an average $771.7 million in costs, followed by New Mexico with $169.0 million, Utah with $155.2 million and Colorado with $142.7 million.

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[8] "Sasol Betting Big on Gas-to-Liquid Plant in U.S.," The New York Times, Dec. 17, 2012, available at http://www.nytimes.com/2012/12/18/business/energy-environment/sasol-betting-big-on-gas-to-liquid-plant-in-us.html?pagewanted+all&__r=0.

[9] "Egyptian Bets $1,4 Billion on Natural Gas—In Iowa," The Wall Street Journal, Sept. 5, 2012, available at http://online.wsj.com/article/SB10000872396390443589304577633932086598096.html.

[10] "The new boom: Shale gas fueling an American industrial revival," The Washington Post, Nov. 14, 2012, available at http://articles.washingtonpost.com/2012-11-14/business/35506130__1__natural-gas-shale-cf-industries.

[11] "Shale Gas Revolution Spurs Wave of New U.S. Steel Plants," Bloomberg, Dec. 31, 2012, available at http://www.bloomberg.com/news/2012-12-31/shale-gas-revolution-spurs-wave-of-new-u-s-steel-plants-energy.html.

[12] Id.

[13] Fullenbaum, Richard, and John Larson, The Economic and Employment contributions of Unconventional Gas Development in State Economies, June 2012, available at http://www.anga.us/media/content/F7D4500D-DD3A-1073-DA3480BE3CA41595/files/state__unconv__gas__economic__contribution.pdf.__

[14] "Executive Order—Supporting Safe and Responsible Development of Unconventional Domestic Natural Gas Resources," Apr. 13, 2012.

States have long been the primary regulators of hydraulic fracturing. The NAM believes states should continue to be the main regulators of this industry and is concerned that reactive federal regulation could harm any potential gains resulting from increased exploration of shale oil and gas. Where there is a perceived deficiency in any one state's regulatory mechanisms, the federal government should work with the state to fill in the gaps rather than imposing a one-size-fits-all federal rule on states where no deficiencies exist. In fact, there are existing programs in place to ensure that state regulation is sufficient. The State Review of Oil & Natural Gas Environmental Regulations (STRONGER) program reviews states' oil and gas regulatory programs and recommends improvements. The Interstate Oil and Gas Compact Commission also supports the states with model regulations. There is no legitimate reason why the continued operation of these programs will not be sufficient to ensure effective state regulation that meets the federal government's goals.

2. Liquefied Natural Gas (LNG) Exports

The NAM was founded in 1895 on principles of free trade. At the time, the United States was in the midst of a deep recession, and many of the nation's manufacturers saw a strong need to export their products. This commitment to free trade and open markets continues to be embedded in the NAM's policies today. Exports have been and continue to be a critical source of growth and opportunity for manufacturers throughout the United States. The 40 percent increase in goods exports that the United States has enjoyed between 2009 and 2011 has enabled many manufacturers to sustain and, in some cases, even grow employment during very difficult economic times. Export growth is vital not just for those businesses that directly export, but for the many suppliers of inputs and services to those businesses throughout every state.

Natural gas liquefaction is a manufacturing process. To convert natural gas to LNG, the gas is purified by removing any condensates, such as water, oil and mud, as well as other gases, such as carbon dioxide and hydrogen sulfide and trace amounts of mercury. The gas is then supercooled in several stages until it is liquefied and ready for shipping.

The Department of Energy (DOE) has received applications for 15 proposed terminals seeking to export LNG to non-free trade agreement (FTA) countries. While most of these proposed terminals have received approval to export to FTA countries, only one terminal in the United States-Sabine Pass in Louisiana-has been permitted to export to non-FTA countries. Under the Natural Gas Act of 1938, anyone seeking to export natural gas must obtain prior authorization to do so from the DOE. The Act instructs the DOE to issue an order allowing natural gas exports unless, after opportunity for hearing, it finds that the proposed exports would not be consistent with public interests. Exports to FTA countries are deemed to be in the public interest and thus enjoy an expedited permitting process. Even for exports to non-FTA countries, the public interest of LNG exports is presumed, but this presumption is rebuttable on a successful showing that the exports at issue are contrary to the economic, environmental and/or energy security interests[15] of the United States. The public interest finding is specific to and required for each individual export terminal seeking exports to non-FTA countries; thus, each of the 15 pending applicants will need to successfully navigate the public interest determination process.

The NAM believes that LNG exports should be governed by principles of free trade and open markets. The NAM also opposes bans or similar market-distorting barriers to exports of LNG or any other commodity.

Natural gas is vitally important to manufacturers and job creation, as well as achieving affordable energy in this country. We are committed to increasing our vast domestic onshore and offshore energy resources with balanced and sensible regulation. Regarding LNG and natural gas, the NAM's official policy positions were established in March 2012 by the NAM Board of Directors, with full participation in the drafting by both energy producers and users. They are as follows:

> LIQUEFIED NATURAL GAS
>
> The dramatic increase in the domestic natural gas resource base has reduced the likelihood of the need for significant Liquefied Natural Gas (LNG) imports. Some now believe the U.S. could eventually become a net exporter of natural gas. An adequate supply of natural gas is needed to meet the growing demand of the U.S. manufacturing sector in a recovering economy. The NAM strongly supports federal and state policies to accommo-

[15] Economic, environmental and energy security interests are the factors the DOE traditionally considers, although it is within its authority to consider other factors in making the public interest determination.

date growth in domestic natural gas production. We further believe abundant domestic natural gas resources can fuel a renaissance in U.S. manufacturing. The NAM fundamentally supports free trade and open markets. We support a natural gas policy process that is open, transparent and objective.

NATURAL GAS AND MANUFACTURING

Industry relies on natural gas for much of its energy needs and as a raw material. The NAM believes policies that encourage the cost-effective use of natural gas to grow American manufacturing should be encouraged.

The U.S. economy relies on natural gas for much of its energy needs and as a feedstock for commercial products. Natural gas is and will remain an important manufacturing commodity because of its scalability, affordability, versatility and efficiency. The NAM supports policies at the federal and state level that facilitate the responsible and expeditious development of natural gas resources, allowing these benefits to contribute to America's economic recovery and to accrue for energy consumers.

The principles above remain the policy of the NAM on LNG and natural gas.

As clearly indicated by the policy language above, the NAM is not calling for policies that favor LNG exports over the use of natural gas domestically. Nor are we calling for policies that would engineer the opposite. Our policy statements highlight the important role domestic natural gas resources can have for the manufacturing economy. Natural gas truly does have the potential to be a game-changer that could fuel major investments across the manufacturing supply chain, supporting millions of jobs and ensuring that the United States remains the world's top manufacturing economy. As our policy makes clear, we believe "abundant domestic natural gas resources can fuel a renaissance in U.S. manufacturing," and "encourage the cost-effective use of natural gas to grow American manufacturing." We believe in "a natural gas policy process that is open, transparent and objective." With that in mind, the NAM urges the DOE and policymakers to rely on the best-quality information regarding the impact of LNG exports on economic, environmental and energy security interests.

The NAM also opposes bans on the export of LNG. From the President's first State of the Union address, doubling U.S. exports has been a top U.S. goal. From its origins, the United States has been built on exports. In fact, Article I, Section 9 of the U.S. Constitution provides quite explicitly that "[n]o Tax or duty shall be laid on Articles exported from any State," evincing a strong disinclination to limit exports of any product.

With 95 percent of the world's consumers living outside of the United States, export bans on any product, including LNG, can be expected to have far-reaching negative effects, including on domestic economic opportunities, employment and ultimately economic growth. The NAM's policies on international trade, established by the NAM Board of Directors in March 2012, form the basis for this position:

INTERNATIONAL TRADE

The objective of the NAM's international trade policy is to strengthen manufacturing in America and improve the competitiveness of American manufacturing in the worldwide economy. Fairly conducted trade provides opportunities for growth and expansion of manufacturing in America, increases the range of goods and services available to consumers, enhances market-based production globally and contributes to closer understanding and cooperation among nations. The NAM believes this objective can best be achieved by limiting costs and other impediments imposed on U.S. manufacturers and by pursuing and utilizing a rules-based international trading system that enhances the role of free market forces while seeking to eliminate market-distorting governmental intervention.

WTO DISPUTE SETTLEMENT

The NAM believes all WTO member economies, including the United States, should comply with WTO agreements, including the Dispute Settlement Understanding.

The United States and its G-20 partners have repeatedly expressed their deep concern about rising protectionism, including, in particular, export restrictions, which began to proliferate globally as the world economy declined in 2008. Export restrictions are viewed as one of the fastest-growing forms of distortion in the international trading system. The Organisation for Economic Co-operation and Development (OECD) has been keeping an inventory on export restrictions and has pub-

lished analytical work examining the economic concerns with imposing such restrictions.[16]

The United States has been in the forefront of challenging other countries' export prohibitions, starting with China's restrictions on raw material exports and more recently China's restraints on rare earth exports. In the raw materials case the WTO found conclusively that China's raw material export quantitative restrictions were contrary to the core international trade disciplines of the WTO, including GATT Articles XI:1[17] that generally prohibit the use of export bans and quantitative export restraints. These obligations apply equally to the United States, China and all other WTO members.

The United States' ability to challenge other countries' existing exports restraints on agricultural, forestry, mineral and ferrous scrap products-just to name a few-will be virtually nonexistent if the United States begins imposing its own export restrictions. Even worse, as the world's largest economy and largest trading country, U.S. actions are often replicated by our trading partners to our own dismay. If the United States went down the path of export restrictions, even more countries would quickly follow suit and could easily limit U.S. access to other key natural resources or inputs that are not readily available in the United States.

3. Permitting

The long, complex and often unmanageable permitting process remains a major obstacle-if not the major obstacle-to full and robust development of our nation's energy resources. Natural gas development is no exception. The NAM strongly urges this Committee to consider legislation to streamline the permitting process for energy projects.

Natural gas producers must generally obtain permits that include approval of well design, casing and cementing, the well stimulation (hydraulic fracturing) program, chemicals used, waste disposal and storage. They now must also comply with EPA New Source Performance Standards (NSPS) for emissions. For wells on Federal or Indian lands, the BLM proposed rule would add an open-ended new layer of permitting that governs many of the same areas (well construction, water protection, chemical disclosure) as the state permits. Those drilling-specific permits must be obtained in addition to other general state and local permits for construction and related activities.

For an LNG export facility, the permitting process is truly daunting. Applicants not only must apply to the DOE for an export license, but also must engage in an environmental review of their project under the National Environmental Policy Act (NEPA) led by the Federal Energy Regulatory Commission (FERC). Compliance with NEPA requires that the project developer first acquire land and begin design and engineering plans, a two-year time commitment. The NEPA review process requires the input of up to 20 federal and state agencies coordinated by FERC that have a say in the review. During the course of the NEPA review, applicants must obtain, among other things, a dredge-and-fill permit from the Army Corps of Engineers (with input from EPA), a Waterway Suitability Assessment from the U.S. Coast Guard, air permits from EPA and state agencies, and the usual state and local permits for construction and related activities. Detailed project engineering design work and project study is required for compliance with NEPA, requiring tens of millions of dollars in up-front capital and a significant commitment in time. The average time to complete an environmental impact statement (EIS) under NEPA takes an average of 3.4 years, a number that increases by an average of 37 days with each passing year.[18] Assuming the applicant can make it through this process and receives final NEPA approval, the project is still subject to lawsuits from private parties over the substance of the NEPA environmental review for six years. If the applicant somehow survives that process, it also must find long-term contracts to sell the product and approach the financial community to secure financing (roughly $10 billion) to construct and operate the project. All of this is in addition to the export license that must also be obtained from DOE at some point during the process.

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[16] The Economic Impact of Export Restrictions on Raw Materials, OECD (Nov. 2010)

[17] GATT XI:1 states: "No prohibitions or restrictions other than duties, taxes or other charges, whether made effective through quotas, import or export licenses or other measures, shall be instituted or maintained by any contracting party on the importation of any product of the territory of any other contracting party or on the exportation or sale for export of any product destined for the territory of any other contracting party."

[18] Piet deWitt, Carole A. deWitt, "How Long Does It Take to Prepare an Environmental Impact Statement?" Environmental Practice 10(4), December 2008.

The permitting process appears to be getting worse. The EPA and the Sierra Club recently urged FERC to consider the upstream implications of natural gas development when permitting LNG terminals and related pipeline infrastructure in Maryland and Oregon. FERC concluded that upstream natural gas development is not a reasonably foreseeable impact of the construction of an export terminal or related pipeline infrastructure, a finding consistent with NEPA, which requires a "reasonably close causal relationship" in order for an impact to be relevant.[19] However, the EPA and other officials are making a similar argument to extend NEPA with respect to coal export facilities in the Pacific Northwest, and negative precedent established in that context could migrate to natural gas permitting. The NAM strongly opposes using NEPA to require a cradle-to-grave, lifecycle impact analysis that assesses the impact of the cargo and all similar cargo transported through the region, which would create a very dangerous precedent that could be used to block exports of all types.

If manufacturers are to create jobs and boost the economy through natural gas development, they must be able to depend on a predictable, reliable and efficient permitting process. The NAM believes strong actions must be taken to streamline the permitting process for energy projects before it is too late.

CONCLUSION

With the right energy policies in place, manufacturers could experience a true resurgence. Robust development of our nation's vast natural gas resources will help drive domestic manufacturing as a critical component of a true "all-of-the-above" energy strategy. We must expect that other nations will soon develop the technologies and methods to access their own unconventional gas resources, giving the United States a relatively limited window of time in which it can truly exploit the current cost advantage. The NAM stands ready to support the Committee's efforts to promote natural gas development and the manufacturing jobs it can provide.

The CHAIRMAN. Thank you very much Mr. Eisenberg.

We will be working closely with you.

Our next witness, Ms. Frances Beinecke, has been a leading advocate for clean air, water, and protecting our land for many years. We welcome you.

STATEMENT OF FRANCES BEINECKE, PRESIDENT, NATURAL RESOURCES DEFENSE COUNCIL, NEW YORK, NY

Ms. BEINECKE. Thank you very much Chairman Wyden, Senator Murkowski, and members of the committee.

Thank you for holding this hearing today and for inviting me on this critical to testify on this critical issue.

We all know that shale gas is changing our Nation's energy profile.

If extracted and used in ways that minimize environmental risks, natural gas can be one part of a broader strategy to reduce carbon emissions while providing potential economic benefits.

But natural gas cannot be the ultimate answer to our energy future. For that we need clean and renewable power that is used as efficiently as possible.

With stakes this large, it is imperative that we have in place the national safeguards necessary to protect our communities, our environment, and the public health from needless and unnecessary harm. As of now, we lack such safeguards, and those protections we do have are no match for the explosive growth in the use of hydraulic fracturing or fracking in some 30 States across the country.

NRDC believes we need to put those safeguards in place before any further expansion in the use of fracking.

It is important and essential that we get this right as a country.

[19] U.S. Department of Transportation v. Public Citizen, 541 U.S. 752, 767 (2004).

In more than 3 decades as an environmental advocate, I have never seen a single issue that has frightened, antagonized, and activated people across the country like the practice of fracking. Families are angered and frustrated by their inability to control fracking in their towns and sometimes on their own property. They want to know that their water is safe, that their air is clean, and that their lands and farms are protected, and they want to know that their children are healthy.

Now against that background, I'd like you to imagine for a moment that someone came to your community today and said they had a new technology to try out near your home. It would use massive amounts of fresh water and undisclosed toxic chemicals to break up the bedrock deep underground. It would then bring to the surface substances known to cause illness and environmental harm while polluting the air and creating toxic wastes. If someone said that to you today, would your first reaction be to exempt those operations from existing environmental protections and leave control to a patchwork across the entire country? Not likely, and yet that's what's happening with fracking.

Congress has exempted many fracking activities from the most fundamental safeguards we all depend on to protect our environment and health: The Clean Water Act, the Safe Drinking Water Act, the Clean Air Act, waste disposal standards, and the National Environmental Policy Act. No wonder people across the country are worried, and we need to fix that.

Instead Federal agencies have only just begun, halfheartedly at that, to use what authority they do have to protect the public. It's still unclear how much they will ultimately do as Chairman Wyden's letter to the Bureau of Land Management indicated just last week.

A BLM document leaked to the press later in the week indicated that BLM may be going in exactly the wrong direction, weakening even proposed disclosure requirements that were initially identified. There is no justification for these exemptions and lack of action.

We ask this Congress to act and close these dangerous loopholes which deprive Americans of the basic protections they have come to expect.

Meanwhile, as I detail in my written testimony, scientific evidence is mounting about the negative impacts of fracking on the environment. These include damage to health from air pollution that comes from industrializing our landscapes, damage from industrial spills and poorly managed wastewater, and damage to the climate from methane leaks and venting. At the very minimum, the research shows there is no reason to have a default assumption that fracking is harmless or somehow less in need of the kind of Federal oversight that has been routine for similar activities for decades.

Yet, we're not arguing for a complete hands-off approach from the public.

The industry calls for regulation to be left to the States. Let's be clear. We see this as forum shopping.

States often lack the technical resources or the political wherewithal to enforce adequate safeguards. If a number of States were

to begin effectively to oversee this industry, companies would come running to Washington to demand Federal rules to preempt what they would surely call a patchwork of State laws.

Instead, industry now claims that the specifics of fracking are too local to allow for Federal standards. That argument is belied by the industry's own actions because industry has begun working to block Local Governments from controlling fracking.

There is simply no legitimate argument for not using the same cooperative federalism model to oversee fracking that is used for all the other industrial activities that are covered by Federal law.

One final but important point, natural gas, even if properly produced and consumed, is not a complete panacea for our energy challenges. It is still a fossil fuel. When burned, it produces fossil fuel pollution and contributes to climate change. That means that even as we work together to put in place the safeguards we need to protect our environment and health, we must strengthen those policies that promote the energy solutions of tomorrow, including efficiency and renewable power.

We have learned as a country some hard lessons about the consequences of uncontrolled resource extraction. As we confront the emerging challenges of fracking, we must learn from our history and not repeat mistakes of the past. We must get these protections right because we may not get a second chance.

Thank you for the opportunity to appear today, and I look forward to your questions.

[The prepared statement of Ms. Beinecke follows:]

PREPARED STATEMENT OF FRANCES BEINECKE, PRESIDENT, NATURAL RESOURCES DEFENSE COUNCIL, NEW YORK, NY

Thank you, Chairman Wyden and Ranking Member Murkowski, for the opportunity to testify today. My name is Frances Beinecke and I am the President of the Natural Resources Defense Council (NRDC). I have worked with NRDC for more than 30 years. Prior to becoming NRDC's President in 2006, I served as NRDC's Executive Director for eight years. In addition to my work at NRDC, I was appointed by President Obama in 2010 to the National Commission on the BP Deepwater Horizon Oil Spill and Offshore Drilling.

NRDC is a nonprofit organization of more than 350 scientists, lawyers, and environmental specialists dedicated to protecting public health and the environment in the United States and internationally, with offices in New York, Washington D.C., Montana, Los Angeles, San Francisco, Chicago, and Beijing. Founded in 1970, NRDC uses law, science and the support of 1.3 million members and online activists to protect the planet's wildlife and wild places and to ensure a safe and healthy environment for all living things.

I. INTRODUCTION

Today's hearing addresses "opportunities and challenges for natural gas." This is a timely and critically important topic. We all know that shale gas is changing our nation's energy profile. If strong national and state environmental standards for natural gas were in place and strictly enforced—that is, standards to protect health and limit climate change—natural gas could be one part of a broader strategy to reduce carbon emissions, with potential economic gain, even as our country moves forward to a clean energy future centered on renewable energy and energy efficiency. We must make sure that the shale gas boom does not distract us from, or prevent investment in these crucial clean energy strategies, which represent the best path forward.

My testimony focuses on the significant environmental, health and community risks of natural gas production as it takes place today. NRDC opposes expanded fracking until effective safeguards are in place.[1]

Today, there is an extraordinary mismatch between the ever growing scale of fracking—which is occurring in about thirty states—and the limited scope of measures to govern it. Indeed, companies engaged in fracking are not even required to provide enough information to enable scientists and the public to fully understand the nature or extent of the environmental and health risks fracking poses.

We can't eliminate all the risks of natural gas production, but there are many actions the federal government—both Congress and the Administration—as well as the states can and must take to reduce them. Now shale gas production is expanding with supersonic speed without having in place even the basic environmental and public health requirements that apply to other industries. And the passionate and growing community opposition to shale gas production, spurred by concern about its environmental and health impacts, is becoming a major challenge for the natural gas industry

Even George P. Mitchell, the Texas oil and gas magnate known as the "grandfather of fracking," has recognized the need for stronger federal oversight of fracking. In an article in Forbes last year, Mitchell was quoted as saying: "The administration is trying to tighten up controls . . . . I think it's a good idea. They should have very strict controls."[2]

Improved regulation at both the federal and state level can greatly reduce the risks presented by shale gas development by, among other things, requiring the use of best practices and technologies, coupled with strict enforcement. Some companies are already using such practices as green completions, wastewater recycling, closed-loop waste management systems, and more in some locations. These methods have proved to be both economically and technically feasible. But these practices are not being used by all companies in all locations even though they can often save companies money by, for example, capturing more natural gas rather than wasting it and by reducing other forms of waste. Rigorous federal standards and requirements to improve environmental performance are needed to mandate that all operators employ best practices wherever hydraulic fracturing occurs.

II. THE ENVIRONMENTAL AND PUBLIC HEALTH CHALLENGES OF NATURAL GAS PRODUCTION

Oil and natural gas production are expanding across the nation, largely because advanced hydraulic fracturing (also known as "fracking") and horizontal drilling have made it easier to extract oil and gas from previously inaccessible or uneconomical sites. Fracking involves injecting water and chemicals deep into the earth at extremely high pressure to break up layers of rock that harbor deposits of natural gas and/or oil. Hundreds of thousands of new oil and gas wells have been drilled in the past decade, and oil and gas development is now occurring in about thirty states and under consideration in other states.[3] According to some reports, about 90 percent of new wells in North America are fracked.[4]

Shale gas production comes with the risk of a range of environmental and health impacts, including contaminated drinking water supplies; the release of methane, a potent greenhouse gas; unhealthy air quality; poorly managed toxic waste disposal; impairment of rivers and streams; disruption of communities; and destruction of landscapes and wildlife habitat. These impacts stem from all aspects of the shale gas extraction process, including hydraulic fracturing itself, site development, well construction , water, wastewater and waste management; and well operation, trucking and other activities that result in air emissions-especially emissions of air toxics, ozone-forming pollutants and methane, a highly potent greenhouse gas.[5]

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[1] See http://www.nrdc.org/energy/gasdrilling/.

[2] Billionaire Father of Fracking Says Government Must Step Up Regulation, July 19, 2012, Christoper Hellman, Forbes, http://www.forbes.com/sites/christopherhelman/2012/07/19/billionaire-father-of-fracking-says-government-must-step-up-regulation/

[3] http://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=E_ERTW0_XWCD_NUS_C&f=M

[4] Fracking Hazards Obscured in Failure to Disclose Wells, Bloomberg, Benjamin Haas (Aug. 14, 2012), http://www.bloomberg.com/news/2012-08-14/fracking-hazards-obscured-in-failure-to-disclose-wells.html

[5] For that reason, in this testimony, when I refer to hydraulic fracturing or fracking, I am referring to all aspects of shale gas production, including site preparation, drilling, fracking, well integrity, waste storage and management and air emissions.

Real world impacts are occurring right now across the country. Just last week, Ohio regulators observed 20,000 gallons of fracking waste being illegally dumped into a waterway.[6]

The risks and impacts of fracking are becoming more widely acknowledged by a broad range of stakeholders. In 2011, Department of Energy Secretary Steven Chu appointed a Shale Gas Subcommittee of the Secretary of Energy Advisory Board (SEAB Shale Gas Subcommittee)[7]. In their report, the members of this subcommittee, including leading academic experts with a range of perspectives, identified four major areas of concern: possible pollution of drinking water from methane and chemicals used in fracturing fluids; air pollution; community disruption during shale gas production; and cumulative adverse impacts that intensive shale production can have on communities and ecosystems. The Subcommittee concluded:

> There are serious environmental impacts underlying these concerns and these adverse environmental impacts need to be prevented, reduced and, where possible, eliminated as soon as possible. Absent effective control, public opposition will grow, thus putting continued production at risk.[8]

The SEAB Subcommittee recommended that the federal government take a series of actions to address these issues; many of these recommendations have not yet been acted upon.

Public concern is also increasing. A December 2012 Bloomberg National Poll found that 66 percent of Americans want more government oversight of fracking, an increase from 56 percent in a September poll[9].

The concerns are well founded. Let's look in more detail at each of the problems and risks associated with fracking.

A. Chemical Disclosure

Natural gas producers are not required by any federal law to identify the chemicals in the fracking fluids they are injecting into the ground, and state disclosure requirements vary widely. Of the states where fracking takes place, only fourteen states require some level of public hydraulic fracturing disclosure and none of these provides comprehensive disclosure. An NRDC analysis found that even where some disclosure is required, the public is hampered in getting this most basic information about fracking. For example,

- In some states it is difficult for the public to access the information disclosed;
- Only seven of fourteen states mandate the chemical identification of all additives used in fracking fluids;
- Only one state has a clear process for evaluating and approving or denying trade secret exemption claims; and
- Only six states provide for access to trade secret information by health care providers.[10]

In addition, enforcement of state rules is uneven; NRDC has found that state agencies have accepted disclosure reports that lack required information.

The lack of standardized, national disclosure greatly hampers the ability of researchers to study the impacts of fracking on health and the environment. Scientists need transparent, thorough and consistent information on what chemicals different communities are being exposed to. The variation in disclosure requirements among states makes it difficult to do comparative studies and deprives communities of information they have a right to know.

B. Health Concerns Related to Drinking Water and Air Pollution

Scientific concern about the health impacts of fracking are growing. In April 2012, the Institute of Medicine (IOM), part of the National Academy of Sciences, convened a two-day workshop of public health experts that included more than a dozen presentations raising concerns about the health implications from natural gas develop-

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[6] Ohio EPA investigating dumping of drilling waste water in Youngstown area, Feb. 4, 2013, Bob Downing, Beacon Journal, http://www.ohio.com/news/ohio-epa-investigating-dumping-of-drilling-waste-water-in-youngstown-area-1.370584.

[7] I serve on the Secretary of Energy's Advisory board, but not the Shale Gas Subcommittee.

[8] http://www.shalegas.energy.gov/resources/081111_90_day_report.pdf

[9] Tougher Fracking Regulations Backed by 66%, Poll Shows, Bloomberg, Dec. 13, 2012, Mark Drajem, http://www.bloomberg.com/news/2012-12-14/tougher-fracking-regulations-backed-by-66-poll-shows.html

[10] NRDC Issue Brief, State Hydraulic Fracturing Disclosure Rules and Enforcement: A Comparison (July 2012), Matthew McFeeley, http://www.nrdc.org/energy/files/Fracking-Disclosure-IB.pdf

ment.[11] Additionally, government agencies, including the Agency for Toxic Substances Disease Registry (ATSDR) within the Department of Health and Human Services (HHS) and the Environmental Protection Agency (EPA), have investigated and found risks from individual sites and practices.[12] Health-related advisories and informational resources have been made available by the National Institute for Occupational Safety and Health (NIOSH), the Occupational Safety and Health Administration (OSHA)[13] and the Pediatric Environmental Health Specialty Units (PEHSU).[14]

A growing number of people have reported health problems that they attribute to chemical exposures from nearby fracking and production activities. As noted above, research is stymied by the lack of disclosure of information on chemicals used in fracking. In addition, little if any on-site monitoring is required of emissions into air or water. But some of the pollutants associated with fracking are also known to cause the same types of respiratory and/or neurological problems that are the focus of concern in impacted communities. Some of these chemicals are also well-established as carcinogens.[15]

Fracking also can generate pollution from hazardous substances, including metals, radioactive material, methane and other volatile organic compounds (VOCs), that are found in the geologic deposits being exploited and brought to the surface in the drilling, fracking, and production processes.

Chemicals in Drinking Water.—Because fracking is exempt from many environmental monitoring requirements, there are inadequate data on the impact of natural gas production on water contamination. However, data from private wells and a published investigation raise concerns that water contamination from fracking is creating health risks. Potential contaminants include methane, organic chemicals (including benzene, a known carcinogen), metals and radioactive elements.

A published study from Pennsylvania documented evidence of drinking water contamination with methane associated with shale gas extraction. These researchers found increased levels of methane in wells closer to well sites including levels that present an explosion hazard for residents.[16] Other household-level investigations conducted by state and federal agencies have also found methane levels in drinking water in homes near drill sites that were caused or are suspected to have been caused by oil and gas operations and present an explosion hazard as well as an asphyxiation hazard for residents.[17]

One study reported severe impacts to livestock, including reproductive abnormalities, acute kidney or liver failure and death, in animals that drank from polluted ponds and creeks near fracking operations.[18]

The same study also documented a family living near a fracking site that reported symptoms such as headaches, nosebleeds, and skin rashes; the symptoms subsided when the family was relocated, suggesting a causal link with the nearby fracking operations.

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[11] Institute of Medicine. 2012. Workshop on the Health Impact Assessment of New Energy sources: Shale Gas Extraction. April 30-May 1, 2012. Washington, DC. http://www.iom.edu/Activities/Environment/Environmental HealthRT/2012-APR-30aspx.

[12] Masten, S. 2012. HHS & NIEHS Activities Related to Hydraulic Fracturing and Natural Gas Extraction. Presentation made at the 2012 Shale Gas Extraction Summit: October 2, 2012. http://environmentalhealthcollaborative.org/images/ScottPlenary.pdf; ATSDR, Health Consultation: Public Health Implications of Ambient air Exposures to Volatile Organic Compounds as Measured in Rural, Urban, and Oil & Gas Development Areas Garfield County Colorado (2008); United States Environmental Protection Agency (US EPA). 2012. EPA's Study of Hydraulic Fracturing and Its Potential Impact on Drinking Water Resources. http://www.epa.gov/hfstudy/ .

[13] Occupational Safety Health Administration (OSHA) 2012. Hazard Alert, Worker Exposure to Silica During Hydraulic Fracturing. www.osha.gov/dts/hazardalerts/hydraulic_frac_hazard_alert.html;

[14] Pediatric Environmental Health Specialty Units and the American Academy of Pediatrics. 2011. PEHSU Information on Natural Gas Extraction and Hydraulic Fracturing for Health Professionals. http://aoec.org/pehsu/documents/hydraulic_fracturing_and_children_2011_health_prof.pdf;

[15] ATSDR, Health Consultation: Public Health Implications of Ambient Air Exposures to Volatile Organic Compounds as Measured in Rural, Urban, and Oil & Gas Development Areas Garfield County Colorado (2008)

[16] Osborn, SG, A Vengosh, NR Warner, RB Jackson. 2011. Methane contamination of drinking water accompanying gas-well drilling and hydraulic fracturing. Proceedings of the National Academy of Sciences, U.S.A. 108:8172-8176. http://www.biology.duke.edu/jackson/pnas2011.pdf.

[17] See, e.g., USEPA 2011. Draft Investigation of Ground Contamination near Pavillion, Wyoming. EPA 600/R-00/000

[18] Bamberger M, Oswald RE. Impacts of gas drilling on human and animal health. New Solut. 2012;22(1):51–77.

Studies linking specific health impacts to drinking water contamination resulting from fracking operations have not yet been conducted, which illustrates the results of under-regulating this industry, but the evidence suggests that current practices may be exposing families to unsafe levels of contaminants.

Air Emissions. Fracking operations release air pollutants that can have health consequences at the local and regional level. As with water, researchers are hampered because fracking operations have been exempted from many monitoring requirements. But some of the health complaints reported by people living near fracking sites, particularly respiratory and neurological symptoms, are consistent with exposure to the chemical contaminants identified in some monitoring reports./ 19/ All of this underscores the urgent need to require effective pollution control equipment and community-level air quality monitoring to better assess the exposures and potential health risks. In the meantime, there is a strong rationale for reducing this contamination immediately to prevent potentially harmful exposures.

The research, monitoring data, and public health expertise available to date indicate that natural gas facilities produce air pollution that can increase health risks. These risks increase with proximity, particularly for populations more vulnerable to the impacts of air pollution, which include children, elderly, and those with underlying health problems.

Fracking activities expose communities to a range of harmful air pollutants, including known carcinogens, and respiratory, neurological, immunological and reproductive toxins. These pollutants are present in the diesel emissions released by truck traffic and heavy equipment use. Additionally, fracking operations can expose communities to silica dust, which causes lung disease. Workplace investigations at fracking sites have identified both silica and diesel as posing a health hazard for workers exposed on the job site.[20] Since state laws allow drilling as close as 100 feet to residences, sensitive populations, such as children, may also be threatened by this pollution.

VOCs released from natural gas wells and processing facilities have been shown to play a significant role in increasing unhealthy air quality, including from ground-level ozone. In the past year, four published studies have identified pollution from oil and gas facilities, where fracking is being deployed, as a source of pollutants contributing to regional ozone in Colorado, Texas, and Pennsylvania.[21] [22] [23] [24] Ground-level ozone is a powerful respiratory toxicant that is well known to aggravate asthma and other respiratory conditions.

Additionally, a study in Colorado found elevated levels of air pollutants close to well sites during well production. Taken together, these pollutants were found to be high enough to put nearby residents at risk for respiratory and neurological health impacts.[25]

In addition, proximity to these facilities can also subject individuals to light and noise pollution, wastewater spills, noxious odors, and increased health and safety risks from explosions and other malfunctions. For this reason, as noted above, separating vulnerable populations from sources of air pollution and other hazards, should be an integral part of ensuring health and safety.

All of these indications of health risks are cause for concern, underscoring the need to better protect the public. That means requiring mandatory disclosure of all chemicals used in fracking, thorough evaluations of potential health threats, the

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[19] McKenzie Witter RZ, Newman LS, Adgate JL. 2012. Human Health Risk Assessment of air Emissions from Development of Unconventional Natural Gas Resources. Sci Total Environ. 2012 May 1;424:79-87.

[20] Esswein E et al 2012. NIOSH Field Effort to Assess Chemical Exposures in Oil and Gas Workers: Health Hazards in Hydraulic Fracturing. Presentation made at IOM Roundtable: The Health Impact Assessment of New Energy Sources: Shale Gas Extraction. April 30-May 1, 2012

[21] Petron G, Frost G Miller BR, Hirsch AI, Montzka SA, Karion A., Trainer M, Sweeney C, Andrews AE, Miller L, Kofler J, Bar-Iian A, Dlugokencky EJ, Patrick L, Moore CF, Ryerson TB, Siso C, Kolodzey, W, Lang PM, Conway, T, Novelli P, Masarie K, Hall B, Guenther D, Kitzis, D, Miller J, Welsh, D, Wolfe D, Neff W, Tans P. 2012. Hydrocarbon emissions characterization in the Colorado Front Range: A pilot study. Journal of Geophysical Research, VOL. 117.

[22] Gilman JB, Lerner BM, Kister WC, de Gouw J, 2013. Source signature of volatile organic compounds (VOCs) from oil and natural gas operations in northeastern Colorado. Environ Sci Technology DOI: 10. 1021/es304119a

[23] Litovitz A, Curtright A, Abramzon S, Burger N. Samaras C. 2013. Estimation of regional air-quality damages from Marcellus Shale natural gas extraction in Pennsylvania. Environ. Res. Lett. 8.

[24] Olaguer E 2012. The potential near-source ozone impacts of upstream oil and gas industry emissions. Journal of Air and Waste Management. 62:8, 966–977

[25] McKenzie Witter RZ, Newman LS, Adgate LS, Adgate JL. 2012. Human Health Risk Assessment of air Emissions from Development of Unconventional Natural Gas Resources. Sci Total Environ. 2012 May 1;424:79–87.

best possible pollution controls and drilling and fracking standards, and increased air and water monitoring both before and after drilling and fracking begin.

C. Climate Change Impacts

When natural gas is burned at a power plant to generate electricity, it emits far less carbon pollution than coal-based electricity.[26] But the production of natural gas produces significant methane emissions[27] Methane, which makes up as much as 90 percent of natural gas, is a potent global warming pollutant, trapping at least 25 times more solar radiation than carbon dioxide over a 100-year period. According to both the EPA's national inventory of greenhouse gas emissions and the EPA's tabulation of individual companies' emission data reports,[28] the oil and gas industry is the nation's second largest industrial emitter of greenhouse gases (mainly methane and carbon dioxide), surpassed only by electric power plants.[29]

Currently, methane leaks into the atmosphere at many points in the natural gas production and distribution process—from wells during extraction, from processing equipment while compressing or drying gas, and from poorly sealed equipment while transporting and storing it. While much better data are needed, EPA estimates that at least 2 to 3 percent of all natural gas produced by the U.S. oil and gas industry is lost to leaks or vented into the atmosphere each year[30], and some recent studies suggest that the actual leak rate could be much higher.[31] Preventing the leakage and venting of methane from natural gas facilities would reduce pollution, enhance air quality, improve human health, and conserve energy resources.

The oil and gas industry can afford methane control technologies. Indeed, capturing currently wasted methane for sale could bring in more than $2 billion of additional revenue each year. Ten technically proven, commercially available, and profitable methane emission control technologies together can capture up to 80 percent of the methane currently going to waste.[32] EPA, other federal agencies, and the states should move to require use of these technologies for methane control, and industry itself should move quickly to adopt these measures.

Last year, EPA issued a Clean Air Act rule to curb VOC emissions from new and modified sources in the oil and gas industry.[33] While this is a step forward, the rule is not strong enough and doesn't cover existing sources. EPA should also regulate methane directly, which would achieve much larger emission reductions.

D. Water Pollution

In addition to the risk of contaminating drinking water, shale gas extraction can pollute streams, rivers, lakes and other waterbodies.[34] This can happen in a number of ways, including the following:

1. Depletion of Water Resources.—Large volumes of water are required for fracking operations. Fresh water is often taken from local waterbodies. Because water can be contaminated when it has been used for fracking, it cannot be eas-

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[26] U.S. Environmental Protection Agency, Clean Energy-Air emissions, available at http://www.epa.gov/cleanenergy/energy-and-you/affect/air-emissions.html.

[27] NRDC, Leaking Profits: The U.S. Oil and Gas Industry Can Reduce Pollution, Conserve Resources, and Make Money by Preventing Methane Waste (Mar. 2012), available at http://www.nrdc.org/energy/leaking-profits.asp.

[28] EPA, Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–2010, Table ES-2, http:/www.epa.gov/climatechange/Downloads/ghgemissions/US-GHG-Inventory-2012-Main-Text.pdf,

[29] EPA, Greenhouse Gas Reporting Program, 2011 Data, http://epa.gov.ghgreporting/ghgdata/reported/index.html

[30] U.S. Energy Information Administration, Natural Gas Gross Withdrawals and Production, 2010 data. available at http://www.eia.gov/dnav/ng/ng_prod_sum_dcu_NUS_a.htm; U.S. Environmental Protection Agency, Inventory of U.S. Greenhouse Gas Emissions and Sinks (1990-2009) (Apr. 15, 2012). Net emissions of methane are just over 600 bcf (billions of standard cubic feet), while gross withdrawals were approximately 26,800 bcf; this implies a net leakage of approximately 2.3 percent.

[31] Robert Howarth et al., "Methane Emissions from Natural Gas Systems," Background Paper Prepared for the National Climate Assessment (reference number 2011-0003) (Feb. 25, 2012), available at http://www.eeb.cornell.edu/howarth/Howarth%20et%20al.%20--%20National%20Climate%20Assessment.pdf.

[32] NRDC, Leaking Profits: The U.S. Oil and Gas Industry Can Reduce Pollution, Conserve Resources, and Make Money by Preventing Methane Waste (Mar. 2012), available at http://www.nrdc.org/energy/leaking-profits.asp.

[33] U.S. Environmental Protection Agency, Federal Register Vol. 77, No. 159, Oil and Natural Gas Sector: New Source Performance Standards and National Emission Standards for Hazardous Air Pollutants Reviews (Aug. 16, 2012), available at https://www.federalregister.gov/articles/2012/08/16/2012-16806/oil-and-natural-gas-sector-new-source-performance-standards-and-national-emission-standards-for.

[34] Hydraulic Fracturing Can Potentially Contaminate Drinking Water sources, NRDC, http://www.nrdc.org/water/files/fracking-drinking-water-fs.pdf.

ily be returned to these waterbodies. Permanent loss of water from fresh water resources can harm water quality and availability and also aquatic species and habitat.[35]

2. Spills and Leaks of Fracking Chemicals and Fluids.—Fluids, including hazardous chemicals and proppants used in the fracking process, are typically stored in tanks or pits on site. If not stored properly, they can leak or spill, polluting nearby waterbodies. Fluids can also be stored at a centralized facility near multiple wellpads and then be transported to the well by trucks or by pipeline, providing another opportunity for leaks and spills during transit. Fracking fluid can also spill during the fracking process. Leaks from tanks, valves, and pipes, as a result of mechanical failure or operator error at any point during these processes, can and do contaminate groundwater and surface water.[36]

3. Mismanagement of fracking waste.—After fracking, some of the fracking fluid, often referred to as flowback, returns up the wellbore to the surface. In addition, naturally occurring fluid is brought to the surface along with the produced oil or gas (referred to as "produced water"). This waste, consisting of both flowback and produced water, can be toxic, and the oil and gas industry generates hundreds of billions of gallons of it each year.[37] In addition to the chemicals that were initially injected, flowback and produced water may also contain hydrocarbons, heavy metals, salts,[38] and naturally occurring radioactive material. The wastewater is sometimes stored in surface pits. If the pits are inadequately regulated[39] or constructed, they run the risk of leaking or overflowing and can pollute groundwater and surface water.[40] The waste may also be disposed of on the surface, reused in another well, re-injected underground, or transported to a treatment facility. Each of these forms of wastewater management carries its own inherent risks, including spills, leaks, earthquakes (in the case of underground injection) and threats to groundwater and surface water.

4. Stormwater Pollution.—During a rainstorm or snowstorm, flowing water causes soil erosion and picks up pollutants along the way, including toxic materials and sediment, and these materials can flow into local waterbodies. Stormwater from fracking operations can be particularly polluted because of chemical and oil and gas residues. (Yet, as is described below, the oil and gas industry is exempt from the stormwater permitting requirements of the Clean Water Act).

I must stress that there are numerous examples of these types of water pollution impacts occurring. I mentioned that just last week Ohio regulators observed 20,000 gallons of fracking waste being illegally dumped into a waterway.[41] And a September 2011 Denver Post investigation found that four oil and natural gas companies were responsible for 350 spills in Colorado since January, 2010. The Post reported that one of these companies was responsible for three spills in one month alone, including benzene, a known carcinogen, and had contaminated both local lands and water.[42] Ironically, state regulators had lauded these four companies as "outstanding operators." Overall, the investigation found that spills took place in Colorado at the rate of seven per week and that from January to September 2011, more than two million gallons of diesel, oil, drilling wastewater and chemicals were spilled, and state regulators issued few fines. A 2012 Post investigation found that over a five year period, oil and gas operations were responsible for 2,078 spills and

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[35] Soeder, D.J., and Kappel, W.M., 2009, Water Resources and Natural Gas Production fromt he Marcellus Shale: U.S. Geological Survey Fact Sheet 2009-3032, 6 p., available at: http://pubs.usgs.gov/fs/2009/3032/.

[36] See, e.g., DEP Investigating Lycoming County Fracking Fluid Spill at XTO Energy Marcellus Well, http://www.portal.state.pa.us/portal/server.pt/community/newsroom/14287?id=15315&typeid=1.

[37] U.S. Government Accountability Office, Energy-Water Nexus: Information on the Quantity, Quality, and Management of Water Produced during Oil and Gas Production, GAO-12-156 (Washington, D.C.: Jan 9, 2012).

[38] Otton, J.K., 2006, Environmental aspects of produced-water salt releases in onshore and estuarine petroleum-producing areas of the United States: a bibliography: U.S. Geological Survey Open-File report 2006-1154, 223p.

[39] NRDC, "Petition for Rulemaking Pursuant to Section 6974(a) of the Resource Conservation and Recovery Act Concerning the Regulation of Wastes Associated with the Exploration, Development, or Production of Crude Oil or Natural Gas or Geothermal Energy," September 8, 2010, 18–23.

[40] See, e.g., DEP Fines Atlas Resources for Drilling Wastewater Spill in Washington County, http://www.portal.state.pa.us/portal/server.pt/community/newsroom/14287?id=13595&typeid=1

[41] Ohio EPA investigating dumping of drilling waste water in Youngstown area, Feb. 4, 2013, Bob Downing, Beacon Journal, http://www.ohio.com/news/ohio-epa-investigating-dumping-of-drilling-waste-water-in-youngstown-area-1.370584

[42] http://www.denverpost.com/breakingnews/ci__18880544

slow releases and that 17 percent of these spills had reached groundwater. In one county alone, Weld County, 40 percent of spills reached groundwater.[43]

E. Impacts on Wildlife Habitat and Sensitive Lands

Oil and gas development can destroy wildlife habitat and sensitive lands if siting does not take these factors into account. Natural gas production operations involve extensive road building and construction of wellpads that can fragment and destroy habitat and cause species to leave their historic breeding and nesting grounds. Light and noise disturb wildlife populations and may drive them to lower quality habitat, and runoff and spills can pollute aquatic habitat.[44]

F. Community Impacts

Oil and gas development can fundamentally change the nature of communities. Fracking is a heavy industrial activity that entails substantial construction, heavy truck traffic, traffic accidents, and noise and light pollution[45]. It often attracts an influx of out-of-state workers that can bring increases in crime and violence, sexually transmitted diseases and community strife that can stress local emergency, health and other community resources.[46]

Under many state laws, oil and gas rights take precedence—or are interpreted as taking precedence—over surface ownership, so oil and gas wells and the associated industrial activity-including chemical and waste storage and disposal-can be located in residential or agricultural areas regardless of zoning or even the wishes of individual property owners. To address these issues, NRDC has launched a Community Defense initiative to provide legal assistance to localities that seek to hold natural gas extraction to appropriate scientific standards, protect their property or exclude oil and gas production from their communities.[47]

III. CONGRESS SHOULD CLOSE FEDERAL LOOPHOLES FOR OIL AND GAS PRODUCTION

The oil and gas industry has succeeded over many years in getting statutory exemptions from standard environmental protection laws and practices. These unjustifiable loopholes appear in the Clean Air Act, Clean Water Act, the Superfund statute, the Resource Conservation and Recovery Act, and the Safe Drinking Water Act, among others.

There is simply no justification for exempting fracking from the basic environmental laws that have applied to other industrial activities for four decades. Fracking presents at least as many risks as other regulated activities and has just as many interstate implications. Moreover, the current level of disclosure and regulation clearly demonstrates that states lack the technical expertise and political wherewithal to govern fracking. Congress must close the loopholes in cornerstone federal environmental laws.

This is not to say that states have no role to play. Under our system of "cooperative federalism," states can play the lead role in the regulation, permitting, and oversight process. They can try out and adopt different regulatory approaches, as long as they meet federal minimum requirements. But all citizens deserve the protection of federal standards.

Some of the key exemptions for oil and gas production facilities in bedrock U.S. environmental laws are:

SAFE DRINKING WATER ACT (SDWA)

Fracking is exempted from the SDWA unless diesel is used in the fracking process, under a provision enacted in the Energy Policy Act of 2005.[48] This exemption prevents the Safe Drinking Water Act from protecting underground sources of drinking water from fracking impacts and exempts the siting, construction, oper-

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[43] http://www.denverpost.com/environment/ci__22154751/drilling-spills-reaching-colorado-groundwater-state-mulls-test

[44] Energy Development and Impacts on Wildlife (Sept. 11, 2012), Center for Western Priorities; http://westernpriorities.org/2012/09/11/energy-development-and-impacts-on-wildlife/.

[45] MISSING

[46] Whitter R. 2012. Community Impacts of Natural Gas Development and Human Health. Presentation made at IOM Roundtable: The Health Impact Assessment of New Energy Sources: Shale Gas Extraction. April 30-May 1, 2012

[47] http://switchboard.nrdc.org/blogs/ksinding/nrdc__launches__community__fracki.html

[48] Energy Policy Act of 2005, Pub. L. No. 109-58, § 322, 42 U.S.C. § 300h(d)(1)(B)(ii). This provision bypassed a court decision that had previously ordered the EPA to regulate hydraulic fracturing under the SDWA. Legal Environmental Assistance Foundation v. United States Environmental Protection Agency, 118 F.3d 1467 (11th Cir. 1997).

ation, maintenance, monitoring, testing, and closing of fracking sites from regulation under the SDWA.

CLEAN WATER ACT

Oil and gas operations are exempt from the stormwater runoff permitting requirements of the Clean Water Act.[49] With this exemption, there is no way to know if a company has an adequate Storm Water Pollution Prevention Plan in place to reduce the discharge of pollutants to receiving waters, and to eliminate illegal discharges.

CLEAN AIR ACT

The oil and gas exploration and production industry is exempt from critical Clean Air Act requirements to adequately assess, monitor, and control hazardous air pollutants.[50] This makes it impossible, under existing regulatory statutes, to perform an adequate assessment of air pollution health risks to nearby communities and require adequate safeguards. Excluding this important category of air pollution and air contaminants significantly underestimates the health risks posed by this industry.

HAZARDOUS WASTE MANAGEMENT AND SUPERFUND STATUTES

Oil and gas waste is exempt from the central federal hazardous waste management law—the Resource Conservation and Recovery Act—including testing, treatment and disposal provisions that govern the assessment, control and clean-up of hazardous waste.[51] Similarly, the oil and gas industry is protected from liability for spills under the Comprehensive Environmental Response, Compensation and Liability Act (the Superfund statute), which adopts the same definition of hazardous waste.[52]

NATIONAL ENVIRONMENTAL POLICY ACT (NEPA)

Under a special provision of NEPA, when oil and gas companies lease federal lands, they are often exempt from customary environmental review requirements applicable to other industries.[53] A recent Government Accountability Office study found that in a sample from fiscal years 2006-2008, the oil and gas industry received almost 6,900 categorical exclusions (CXs) that waived further environmental review under NEPA. Of that total, almost 6,100 of those CXs were used to waive requirements for permits to drill.[54]

IV. BLM'S POTENTIAL ROLE IN PROVIDING NATIONAL LEADERSHIP ON BEST PRACTICES FOR NATURAL GAS PRODUCTION

Given this Committee's jurisdiction, I want to stress an important opportunity for the Bureau of Land Management (BLM) to show leadership on this issue. The BLM oversees approximately 700 million subsurface acres of Federal mineral estate and 56 million subsurface acres of Indian mineral estate across forty states. As of 2011, 38.5 million acres of oil and gas resources were leased by the federal government. These lands include private property in a split estate situation, or national forests that are watersheds for large populations. A March 2012 Department of Interior report found that 56 percent of federal onshore leases were neither in exploration nor production-an area about the size of South Carolina. This is the time to minimize the impacts that will come with future fracking. As Chairman Wyden noted in his recent letter to BLM, new BLM rules must require best practices for fracking and protect environmentand health . But the latest indications are that BLM is going in exactly the wrong direction.

A version of the draft rule leaked to the press last week indicates that BLM is in the process of weakening disclosure requirements and environmental protections in its proposed rule.[55]

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[49] 33 U.S.C. § 1342(l)(2); 33 U.S.C. § 1362(24).

[50] 42 U.S.C. § 7412(a)(1)-(2); 42 U.S.C. § 7412(n)(4).

[51] 42 U.S.C. § 6921(b)(2). Under this provision, EPA may act to close this gap under specified circumstances, but has not done so.

[52] 42 U.S.C. § 9601(14).

[53] 42 U.S.C. § 15942.

[54] U.S. Gov't Accountability Office, GAO-11-941T, Energy Policy Act of 2005: BLM's Use of Section 390 Categorical Exclusions for Oil and Gas Development (2011).

[55] Revised Interior rule loops in industry-favored FracFocus, EnergyWire, Feb. 8, 2013, Mike Soraghan and Ellen M. Gilmer, http://www.eenews.net/energywire/2013/02/08/1

The BLM rule should

- provide adequate and comprehensive disclosure of chemical and other information to the public;
- place sensitive areas off limits;
- require safe setbacks for homes, schools, and streams;
- establishe strong standards for well construction that ensure mechanical integrity;
- require baseline testing of water sources; and
- increase the safety of toxic waste management by prohibiting open air pits.

Details on NRDC's proposals are available in our comments to the BLM.[56]

V. CLIMATE CHANGE AND ENERGY POLICY

Federal law and policy must also take into account the need to move the U.S. away from the use of fossil fuels, including natural gas. The United States' largest source of climate-changing pollution remains the air emissions from hundreds of existing power plants. We must curb this dangerous source of pollution and do so in a way that will build the economy and promote energy efficiency and renewable energy. NRDC has crafted a groundbreaking proposal[57] that will help the United States create jobs, grow the economy, and curb climate change by reducing emissions from hundreds of existing power plants. NRDC's proposal shows how EPA, in partnership with the states, can set new carbon pollution standards under existing authority in the Clean Air Act that will cut existing power plant emissions 26 percent by 2020 (relative to peak emissions in 2005).

The approach includes an innovative provision that will provide states with flexibility and drive investment in cost-effective electric energy efficiency, substantially lowering the cost of compliance, lowering electricity bills, and creating thousands of jobs across the country. The benefits of this approach—in saved lives, reduced illnesses, and climate change-exceed the costs by as much as 15-to-one. The Administration should move quickly to finalize the carbon standards they have proposed for new power plants and propose a system of regulation for existing plants, building on the ideas we have proposed.

After electric generation, other primary uses of natural gas energy are in buildings and industrial applications. There are many opportunities to use natural gas more efficiently in these settings. Enhanced building energy codes and stronger efficiency standards for appliances, equipment and cooling and heating systems are among the best ways to use natural gas more efficiently. As is explained in a recent report by the Alliance to Save Energy's Commission on National Energy Efficiency Policy (on which I served), it is important that DOE stay on track to meet all of its statutory deadlines and responsibilities to strengthen energy efficiency standards for natural gas and electric appliances.[58] After a strong start at the beginning of the last term, DOE has fallen behind on this important responsibility.

VI. NEXT STEPS: BUILDING THE OVERDUE REGULATORY FRAMEWORK FOR ADDRESSING THE IMPACTS OF FRACKING

I've discussed above the need for Congress to take strong action to protect the environment and health, including by requiring full disclosure of fracking chemicals and closing loopholes in existing environmental statutes. And I've reviewed the need for BLM to issue rules properly governing fracking on public lands. Other significant actions that the federal government should take to limit the damaging impacts of fracking include:

Congress

- Congress should mandate and fund comprehensive studies on the environmental and health impacts of fracking and on how to address them. EPA is conducting a comprehensive scientific study into the risks of fracking on drinking water, due in 2014. This will be the first independent study of its kind. The Agency for Toxic Substances and Disease Registry , the National Institute of Environmental Health Sciences and the National Institute for Occupational Safety and Health should conduct worker and community health investigations.

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[56] http://docs.nrdc.org/energy/files/ene__12091101a.pdf

[57] Daniel A. Lashof ET AL., Closing the Power Plant Carbon Pollution Loophole: Smart Ways the Clean Air Act Can Clean Up America's Biggest Climate Polluters, NRDC (Dec. 2012), http://www.nrdc.org/air/pollution-standards/files/pollution-standards-report.pdf.

[58] Doubling U.S. Energy Productivity by 2030, ALLIANCE COMMISSION ON NATIONAL ENERGY EFFICIENCY POLICY (Feb. 7, 2013), http://ase.org/sites/default/files/full__commission__report.pdf.

- Congress should ensure that both the BLM and EPA have sufficient funding to inspect natural gas production facilities and to enforce compliance. These agencies must be able to vigorously investigate complaints.
- Congress and the Administration should take action to implement the recommendations of the 2011 Shale Gas Subcommittee of the Secretary of Energy Advisory Board.

Bureau of Land Management

BLM should

- Revise all of its rules for natural gas production including leasing and management plans to reflect current technologies and the extent of development so it protects the resources that are used by Americans for hunting, fishing, hiking, and other activities. The BLM is too often allowing oil and gas development without conducting the proper environmental analysis or considering the impacts on human health, the environment, wildlife, and vital natural resources.
- Together with other federal land management agencies, protect the most sensitive public lands, placing them off limits to oil and gas development. This includes important drinking water sources and wilderness quality lands. For example, the George Washington National Forest in Virginia is home to the headwaters of the Potomac and James Rivers which supplies water for approximately four million people, including all of Washington, D.C. and Maryland and Virginia suburbs, yet the Forest Service is considering allowing fracking there.

EPA

EPA should use its existing authority to the fullest extent possible to address the impacts and risks of fracking, including taking the following actions

- Issue stringent standards to limit methane, carbon dioxide, and hazardous emissions from natural gas production from both from new and existing sources. Cost-effective technology exists to do so, as noted above. In addition, EPA must adopt standards for VOCs and methane from fracked oil wells, which can emit huge amounts of this ozone-forming pollutant.
- Ban the use of diesel in fracking fluid to protect drinking water and waterbodies.
- Issue strong Clean Water Act rules for the discharge of wastewater generated by natural gas fracking and production.
- To the extent possible under existing law, conduct a thorough assessment of air toxic emissions, health threats, and available pollution control technology that includes all relevant sources of emissions of all contaminants. Based on this assessment, EPA should set strong standards to limit pollution that threatens nearby populations from new and existing facilities.
- Make resources available to state and local clean water agencies as needed for the monitoring of groundwater, investigation of drinking water contamination and remediation.

VII. CONCLUSION

This testimony has focused on the scientific and legal issues posed by the expansion of fracking, but in closing I want to bring us back to the experiences and fears of real people to underscore what is at stake. On a recent trip to western Pennsylvania, I spoke to many families affected by shale gas production. These families told me that they fear that their water is contaminated with toxic substances from shale gas operations. They worry the air pollution coming from compressor stations or well pads is harming their families. And they believe their property values have been compromised. I witnessed two instances of flammable water, one in a field, another in a jug of drinking water. I don't know what caused them, and sadly the state doesn't seem to have investigated to determine the causes, but I could see how disturbing it was for homeowners to have flaming water. Every single person we spoke with had stories of contaminated water or air.

I sensed a lot of fear in the communities I visited in Pennsylvania. It reminded me of when I served on the National Commission on the BP Deepwater Horizon Oil Spill and Offshore Drilling and people in Louisiana and Mississippi told me how scared they were for the health of their families. They knew they had been exposed to oil and to chemicals used in the dispersants, but they didn't know if that exposure would be harmful or how to keep their families safe.

I know that we can do better for these families and communities, and hope that today's hearing will provide the basis for positive change

As I've indicated, a lot of action is needed, and it is needed now. The federal government has been asleep at the switch—although it may be more accurate to say

it's been anesthetized, given all the exemptions that have been worked into statute. NRDC stands ready to assist this Committee in its further deliberations. Thank you again for the opportunity to participate in this discussion.

The CHAIRMAN. Thank you very much Ms. Beinecke.

I think you'll find a lot of bipartisan interest on those efficiency issues that you made a point of at the end, and we thank you.

Ms. BEINECKE. Thank you.

The CHAIRMAN. Dr. Medlock, welcome.

STATEMENT OF KENNETH B. MEDLOCK, III, JAMES A BAKER, III AND SUSAN G. BAKER, FELLOW IN ENERGY AND RESOURCE ECONOMICS, AND SENIOR DIRECTOR, CENTER FOR ENERGY STUDIES, JAMES A. BAKER III, INSTITUTE FOR PUBLIC POLICY, RICE UNIVERSITY, HOUSTON, TX

Mr. MEDLOCK. Thank you for the opportunity to be here.

I want to begin by just commenting on the State of the regulatory infrastructure that we have in our natural gas industry in this country and more broadly, North America. You know, beginning with the Natural Gas Act in the 197—in the late 1970s followed by several FERC orders that were passed up through the 1990s, we've basically seen establishment of a market which arguably is the most efficient market in the world. Basically the reason we can say that is because any consumer that needs or has a desire to get natural gas in any given point in time, any producer that has a desire to actually access a market, the ability is there.

This is largely the result of the regulatory infrastructure that has been put in place. It encourages competition, it encourages entrepreneurship, and it's basically been the reason why in this country we've seen, as it's been called already in this hearing, the Shale Gale emerge in this country.

So anything that sort of could stand to disrupt this very well functioning market, I think would be a detriment to the country and to the natural gas industry.

It was also referenced that, you know, in terms of the number of licenses that have been applied for, we're talking in excess of 30 billion cubic feet a day at this point, so it's quite a large number. But one thing you have to do is take a step back and realize the context in which that volume, that potential volume sets. Namely, the global liquefied natural gas market today is just over 30 billion cubic feet a day. There is no way that if all of those licenses were approved you'd see 30 BCF a day of capacity constructed in this country. You're basically talking about doubling the size of the LNG market. So you have to understand and you have to take in to the proper context, you know the kind of competition that you're seeing.

It's a race to win first move or advantage. It's exactly what you'd expect to see in a competitive market.

Now when we sort of step sort of beyond what's happened with regard to natural gas and shale gas development in this country, we can think about national security issues, which have been also referenced and as a matter of fact, we performed a study for the International—the Office of International Policy and Affairs of the DOE a little over—about 2 years ago now where we looked at the broader geopolitical implications of shale, and this is a mouthful,

and I'm happy to expand in Q&A, but there were 3 countries in particular that were most affected by the emergence of shale in North America. When you think again about foreign policy objectives of this country, not only in the short-term, but even in the immediate-to long-term, this is a mouthful: Russia, Iran, and Venezuela. Those are the 3 countries that most—that were most heavily impacted by shale developments in this country. You take shale out of the mix, and those 3 countries really stand to benefit in a very dramatic way because of their massive natural gas resources and hydrocarbon resources more generally.

Moving beyond that, when we think about a lot of the things that a lot of people have been talking about with regard to gas and to transportation, there's a real potential here for natural gas to displace some oil in our transportation infrastructure, and I think that's a really very important point when we think about national security.

However, there still exists challenges. Moving gas into high use vehicles, into fleet systems, this is something that already stands to benefit a lot of companies that already own and operate these kinds of fleets, like FedEx, UPS. You're even talking about now LNG in long haul trucking. So these sorts of applications are already beginning to occur, not because of policy, but because the commercial incentive is there. It's there right now. So you're starting to see that migration occur.

Moving into the cars that you and I drive, that's going to be a little bit more challenging because you're not talking about vehicles that are driven in excess of 20,000 miles a year. You're talking about vehicles that are driven 12 to 13,000 miles a year and that matters a tremendous amount when you talk about fuel choice and the kinds of capital costs individuals are willing to incur when they buy new vehicles.

On the emissions front, there are studies ongoing with regard to natural gas throughout the value chain and what methane leakage might mean for the real potential that might be there associated with natural gas developments and one of the things that one of the studies that's ongoing—I'm actually very much looking forward to seeing the results of is one that's being conducted by the Environmental Defense Fund. They're looking at—they're measuring methane leakage not only at the well head, but all the way down to the end use. One of the things that I fully expect to see as the result of that study, because it's something that I've actually looked at a little bit in my past is that what you'll see is the most egregious source of methane leakage is what we call in locations in the market in where we call behind-the-fence. So this is after local distribution companies take charge of the gas and that opens up a tremendous amount of discussion around the appropriate policies for how maintenance is performed on systems, not just interstate systems, not just gathering systems, but even behind-the-fence systems, so local distribution companies.

Finally, on the environmental front, when we talk about the potential for natural gas to reduce or achieve certain climate change objectives—emissions objectives. I think we've already seen to some extent just in 2012 their preliminary data what can actually happen if gas can displace older coal facilities from the generation

stack and we're talking about our generation in particular. What we actually saw was that in 2012, because of the low price of natural gas, natural gas actually rose to surpass coal share in generation for some period of the year. What that basically resulted in was CO_2 emissions being as low in this country as they have been since 1990. That's pretty remarkable. What that tells you is that natural gas stands to benefit not only domestic manufacturing, not only domestic producers to the extent that LNG exports actually do occur under a market equilibrium, and I think that's an important point, but it also stands to benefit various environmental objectives.

Again, if we're going to think about appropriate policies, I think the first thing we need to do is gather more information. Which is why I applaud hearings like this and the kinds of things that we're seeing going not only academic, but in the industrial communities, as well.

Thank you.

[The prepared statement of Mr. Medlock follows:]

PREPARED STATEMENT OF KENNETH B. MEDLOCK, III, JAMES A. BAKER, III, AND SUSAN G. BAKER, FELLOW IN ENERGY AND RESOURCE ECONOMICS, AND SENIOR DIRECTOR, CENTER FOR ENERGY STUDIES, JAMES A. BAKER III INSTITUTE FOR PUBLIC POLICY RICE UNIVERSITY, HOUSTON, TX

During the past decade, innovative new techniques involving horizontal drilling and hydraulic fracturing have unlocked a vast resource potential and resulted in the rapid growth in production of natural gas from shale. According to the US Energy Information Administration, gross withdrawals from shale gas wells in the United States has increased from virtually nothing in 2000 to over 23 billion cubic feet per day (bcfd) in 2011, representing over 29 percent of total gross production in the US. Moreover, a recent Baker Institute analysis indicates shale gas production could reach over 50 percent of all domestic natural gas production by the 2030s.[1]

Without doubt, the natural gas supply picture in North America has changed substantially, and it has had a ripple effect around the globe, not only through displacement of supplies in global trade, but also by fostering interest in shale potential in other parts of the world. Prior to the innovations leading to the recent increases in shale gas production, declining domestic production in the United States and Canada was the consensus view, and was a harbinger of increasing reliance in North America on foreign supplies. This resulted in an expectation that prices would rise, and that the US would become a major global sink for global supplies. While many producers around the world began to invest in capabilities to move liquefied natural gas to the US, the late 1990s and early 2000s also witnessed a decline in industrial demand for natural gas as gas-intensive manufacturing activities migrated away. Thus, the North American gas market was undergoing a shift in preparation for increasing import reliance, higher prices, and reduced domestic demand for industrial activities. Even in the power sector, higher prices set the stage for more robust growth in renewable energy sources. But, the rapid growth in shale gas production has since turned all of these expectations upside down. In fact, there is a valuable lesson in what has transpired. Market stresses encourage responses on multiple margins, and there is nothing different about what is going on currently.

To wit, the past few years of rising shale gas production has contributed to lower domestic natural gas prices. This, in turn, has encouraged the substitution of natural gas for coal in power generation, and a revitalization of gas-intensive industrial demands. There has also been interest in creating new demands, such as the use of natural gas in transportation, particularly as the price of crude oil remains well above the price of natural gas on an energy equivalent basis. Finally, there has been growing interest in developing LNG export capability to capture the arbitrage opportunity that currently exists with domestic natural gas prices substantially below prices in Europe and Asia.

[1] The techniques have also matriculated into the oil sector triggering an upstream renaissance in US oil production driven by light tight oil, or shale oil. In fact, domestic oil production has increased year-on-year since 2008, something that has not occurred since the 1960s

This paper discusses the feasibility of the pathways for natural gas that have emerged in the wake of the shale gas revolution. We begin our discussion with the transportation sector, followed by industry, power generation and LNG exports. While this is not meant to be exhaustive, it will highlight some key points that must be brought forth in any policy discussion around natural gas. Namely, there are multiple margins of response to low natural gas prices, and one cannot consider each in a silo; the market certainly does not.

In any case, the domestic supply capability is important in determining the price impacts of growth in demand, regardless of the source. According to a recent Baker Institute study, commercially viable shale gas resources have rendered the domestic supply curve to be very elastic.[2] This means that even modest changes in price will result in significant changes in production. So, the capacity for the US market to absorb large increases in demand without significant upward pressure on price is large. In fact, the central tendency of prices is now projected to be between $4.50/mcf and $5.50/mcf over the next few decades.

Altogether, the aim here is to highlight some critical discussion points when considering the pathways for growth in U.S. natural gas demand. In particular, in traditional end-uses, growth in natural gas demand faces few obstacles other than those presented by market forces. In new demand sectors, however, there are substantial barriers to growth, largely due to high fixed infrastructure costs and return on investment considerations. Thus, although the potential for growth is large—especially in transportation where current gas use is very low relative to total transportation energy use—realizing that potential will be challenging.

NATURAL GAS INTO TRANSPORTATION

The transport sector has historically been dominated by crude oil products, to the tune of 94% of all transport uses in 2010[3]. So, as a point of departure, we must understand how natural gas might penetrate the transportation sector. For the purpose of this discussion, we will focus on two avenues for natural gas into transportation, one direct and the other indirect:

- Compressed natural gas vehicles (CNGVs)
- Electric vehicles (EVs).

One could argue that other issues should enter the discussion, particularly if the goal is to reduce reliance on imported oil. For example, fuel efficiency improvements ultimately lower fuel use per mile driven. We could also discuss methanol and gas-to-liquids (GTL) technologies, in particular because they both require natural gas as a feedstock and could displace crude oil in transportation. Moreover, we cannot ignore the developments in light tight oil (LTO) that have been driving U.S. oil production up since 2008, reversing a downward trend that had persisted since the early 1970s. But, we will return to all of these options below when discussing the considerations that influence investments in different fuel types.

CNG Vehicles

Currently, natural gas use in transportation is only 0.13% of total gasoline use. So, there is a lot of room for growth. In fact, a ten-fold increase in demand would push demand to about 0.9 bcf/day, which is an increase the U.S. market could absorb with relative ease. But, for the low levels of demand that currently exist to change, it will take substantial investment in fueling infrastructure and large adoption of compressed natural gas vehicles (CNGV) by consumers.[4]

One thousand cubic feet of natural gas yields eight gallons of CNG. So, if natural gas price is $4/mcf then the cost of natural gas as a feedstock for CNG production is $0.50/gallon. Adding the processing costs for CNG of approximately $1.00/gallon, we have an estimated wholesale price of $1.50/gallon. In addition, regional prices may differ due to differences in the price of gas, but the price changes by only $0.10/gallon for every $0.80/mcf change in the gas price, so the wholesale price will not vary substantially by region. As a basis for comparison, the wholesale price of gasoline on the NYMEX is currently at $3.00/gallon. If these prices persist, the per gal-

[2] Indeed, the US supply elasticity with shale included in the resource base is roughly 5 times larger than when it is not included, see Medlock, Kenneth B., "US LNG Exports: Truth and Consequences", available at www.bakerinstitute.org (2012). Put another way, the domestic supply curve is very flat.

[3] Data sourced from IEA Energy Statistics and Balances. Ethanol comprises another 4% with natural gas making up the remainder. Note, if pipeline uses are excluded, these values shift even more heavily towards oil.

[4] We could also discuss liquefied natural gas (LNG) options into transportation, but this is primarily for large trucks and local maritime transport. The arguments presented herein still generally apply.

lon fuel cost of CNG is about half the cost of gasoline, before accounting for things such as distribution costs, profits, local and national taxes, and lease payments by station owners. Assuming all these additional costs are equal for CNG and gasoline, we still have a differential between fuels of about $1.50/gallon.

Despite the preceding cost per gallon comparison, cost per gallon is not the appropriate metric for comparison. We must compare the cost per mile of each fuel option. In order to do this for privately-owned vehicles, we need to incorporate the efficiency of a CNGV and a comparable gasoline hybrid vehicle. Then, we can calculate the annual fuel cost savings for each vehicle type. Importantly, we compare the CNGV with the hybrid because these are the two "next generation" technology options currently available.

If we compare the Honda Civic, for example, we have a gasoline hybrid engine efficiency of 44 miles per gallon in the city. The Honda Civic CNGV has a city driving efficiency of 27 miles per gallon. Thus, the cost per mile is $0.0126 lower for the Civic CNGV. If we assume annual driving of 12,000 miles, the fuel savings is $151/year. Assuming a 7 year vehicle life, we see an undiscounted lifetime savings of just over $1,060. The current MSRP for a Civic CNGV is $26,305, and the current MSRP for a Civic Hybrid is $24,200, meaning the price difference is currently $2,105. Thus, the fuel cost savings does not compensate the higher upfront cost of the vehicle. If we discount future savings, the disparity grows. So, the CNGV is not the most attractive option to the consumer looking to purchase a vehicle that also reduces gasoline demand. If, however, the annual mileage jumps to 24,000 miles per year, then the undiscounted fuel cost savings just compensates for the fixed cost differential over seven years. So, high mileage is a prerequisite for the CNGV option to make economic sense given these fuel costs.

The current pricing differential between natural gas and gasoline has been sufficient to promote adoption of CNGVs in commercial fleets. However, commercial fleet opportunities are small when compared to the fleet of privately owned motor vehicles. So, while an economic argument can be made for natural gas into high-mileage commercial fleets, the same is not true for private vehicles, which, absent a change in fixed costs differentials, will limit the movement of natural gas into private vehicles.

Aside from the cost differences, another issue that stands in the way of large scale CNGV adoption is a lack of re-fueling infrastructure. There are currently about 1,100 CNG fueling stations and 59 LNG fueling stations nationwide. These facilities primarily serve large trucks in the case of LNG and light duty trucks in the case of CNG. But, the ability to refuel becomes an issue when one considers the current consumer driving behaviors. In particular, the flexibility implicit in the existing fuel delivery infrastructure (for gasoline) allows drivers the freedom to plan their activities without necessarily planning routes so that they coordinate with re-fueling opportunities. This point is what leads us to the so-called "chicken-and-egg" problem. Namely, consumers bear a cost if they have to search for re-fueling stations (a so-called "search cost"), and this cost can prevent them from buying a CNG vehicle, even if the projected fuel savings compensates for the incremental fixed cost. In turn, station owners may be reluctant to install CNG re-fueling capability if CNGVs are not prevalent enough in the vehicle stock to guarantee some demand for the station's services. Hence, the conundrum—how does one overcome this mismatch to ensure coordinated growth in both CNGVs and re-fueling locations?

Electric Vehicles

Many of the issues facing CNGV adoption into the private vehicle fleet are also faced by EVs, but by differing degrees. Cost of ownership is certainly an issue, as most EVs are more expensive than their non-EV counterparts. Of course, the low cost of electricity can provide significant fuel savings, but even if EV fuel costs are driven down near zero, the projected 7 year undiscounted savings approaches $5,600. The base model Ford Focus EV lists an MSRP of $39,200. This compares with the gasoline-powered base model Ford Focus MSRP of $16,200. So, just as with EVs, the difference in fixed cost is not fully compensated by the fuel savings. Even with the federal tax credit of $7,500, the fuel savings is not sufficient. In other words, rational individuals who buy an EV are doing so for some additional derived benefit.

Aside from the issue of cost, there are also issues associated with re-fueling. Re-fueling electric vehicles has both short term and long term components. In the short term, the existing generating fleet is sufficient to meet almost any expectation of electricity demand growth associated with EV penetration. Moreover, many consumers can re-charge at home, and in some cases re-charging capability is available at work and other non-residential locations. But, the availability of non-residential re-charging stations is not sufficient to support wider adoption of EVs. As of Sep-

tember 2012, according to the EIA there were 4,592 non-residential re-charging locations in the U.S., where some locations have multiple charging units. Moreover, most of these locations are in only a couple of states.

The location of re-charging stations becomes a relevant issue primarily when long distance travel is desired. Currently, range is limited to less than 100 miles per charge in most commercially available EVs on the market today.[5] This creates logistical issues for consumers who wish to drive more than 100 miles for a weekend getaway.

If we think about the prospects of EVs longer term, investments in charging stations can be made, particularly if consumers show a propensity to buy EVs. However, even if the proverbial "chicken-and-egg" problem of vehicles and infrastructure can be overcome, the resulting requirements for new electric generation capacity cannot be understated. For instance, if EVs are widely adopted into the vehicle fleet, a recent Baker Institute report put the projected growth in power generation requirements are 5%, 12% and 21% higher than the "business as usual" case in 2030, 2040 and 2050, respectively.[6] Given the regulatory burden facing other alternatives, the majority of this incremental demand for electricity would likely be met by natural gas. However, it is important to recognize that this incremental demand will take decades to materialize, absent government regulations that accelerate the process.

Some other factors to consider for natural gas into transportation

There are other costs that exist, some of which are not even in the current discussion. Cost of expanding and upgrading electricity infrastructure can become an issue. Effectively, current mechanisms would force non-EV owners to subsidize EV expansion. This could become a political issue. Moreover, currently 18.4 cents per gallon of gasoline purchased flows into the National Highway Fund to support construction and maintenance of public infrastructure. As the gasoline base diminishes, the fund will still need to be solvent, so electricity and natural gas will need to be taxed accordingly. Currently, no such tax exists, so it is left out of most breakeven calculations for purchase of CNGVs and EVs. In the case CNGVs, assuming refueling infrastructure is added, a tax at the pump can be instituted in much the same manner as is currently done with gasoline purchases. But, its implementation will almost certainly be protested by early adopters of CNGVs as it could represent an ex post unexpected increase in the cost of ownership.

In the case of EVs, if mechanisms are proposed whereby electricity sales are taxed, then again, non-EV owners are subsidizing EV expansion. While centralized refueling stations are a possibility, their installation is still a pre-requisite capital expense. Moreover, the issue of tax payments is still present. It is more likely that EV owners will recharge at home. So, a mechanism to tax the owners of EVs specifically must be considered. Just as with early adopters of CNGVs, any tax implemented will represent an ex post unexpected increase in the cost of ownership, and will likely be met with resistance.

INDUSTRIAL DEMAND FOR NATURAL GAS

There are, of course, also ample opportunities for demand growth in traditional, non-transportation end-uses. Power generation and industrial uses make up the bulk of natural gas demand on an annual basis. Seasonally, the balance shifts more heavily to space heating applications in residential and commercial end-uses, specifically in winter months, but the general trends in annual demand growth are set by industrial and power generation uses. In 2012, power generation comprised 36.1% of annual demand and industrial comprised 32.1%.[7] Moreover, the recent low price environment has natural gas use in both sectors poised to grow.

Industrial most recently demand peaked in 1997 (see Figure 1*) reaching levels similar to what was witnessed in the early 1970s. It steadily declined thereafter due to lower cost natural gas in international locations. Industries such as the ammonia and fertilizer industries were heavily favored by lower cost feedstocks elsewhere, and the late 1990s and early 2000s saw many of these types of industrial gas consumers shutter operations in the US Gulf Coast region choosing to move abroad.

[5] For example, the Ford Focus EV has a range of 76 miles and the Nissan Leaf has a range of 73 miles. The Tesla S has an estimated range of over 250 miles, but its cost makes it a prohibitive option for most car buyers.

[6] See "Energy Market Consequences of Emerging Renewable Energy and Carbon Dioxide Abatement Policies in the United States," by Peter Hartley and Kenneth B Medlock III (Sept 2010), available at www.rice.edu/energy.

[7] Data sourced from the U.S. Energy Information Administration.

* All figures have been retained in committee files.

However, much of this has changed in the last few years, and industrial demand has actually grown since 2009, a trend bolstered by low cost natural gas supply due to growth in shale gas production.

An expectation for continued strong supply and stable pricing is being seen in the slate of recent announcements by firms to expand their businesses that rely on natural gas as a feedstock and energy source. Dow Chemical, an industrial user of natural gas, has recently announced a number of significant expansion plans in Texas. Other industrial firms have also announced plans to expand domestically. Methanex has moved forward with plans to relocate its Chilean facility to Geismar, Louisiana, and Sasol has announced intent to move forward with a GTL project in Southwest Louisiana. In short, if price does stay low and relatively stable, it is possible that industrial demand could rise to levels not seen since the mid-1990s. This would represent an over 18% increase in industrial gas demand from its current levels.

It is important to point out that the long term trend seen in the industrial demand sector bears resemblance to a cycle. Indeed, even the recent growth in industrial demand has been modest in comparison to power generation use. Nevertheless, the past few years have seen a renewal of industrial demand for natural gas. Moreover, the planned capital expenditures by gas-intensive industrial players are quite large, signaling a substantial comparative advantage exists to siting production in the US.

POWER GENERATION DEMAND FOR NATURAL GAS

Natural gas demand in the power generation sector has substantial growth opportunity through fuel substitution, and it can occur in a relatively short time frame. In 2012 we saw a dramatic increase in the use of natural gas in power generation through substitution with coal. In fact, the natural gas share of power generation in 2012 rose to over 30%, which was up from an annual average of 17.9% just 10 years ago. This is in stark contrast to coal, which has seen its market share deteriorate from 50.8% to 36% in the same time frame. In fact, much of the drop in coal's share in power generation is directly attributable to grid-level switching to natural gas.

The rise of gas use at the expense of coal was primarily the result of relatively low natural gas prices, and the fact that there is sufficient natural gas generating capability to allow for large scale, grid-level fuel switching. Much of the existing natural gas fleet that can capitalize on relative price movements was brought into service between 2000 and 2005 (see Figure 2). In fact, natural gas generation capacity surpassed the installed capacity of coal in the US in the early 2000s. Moreover, most of the capacity that was added employs the latest generation combined cycle technology, meaning its thermal efficiency is substantially higher than the majority of the existing coal fleet.

Figure 3 indicates the prices at which existing capacity of natural gas displaces coal in power generation when the price of coal is $65/short ton (the average 2012 NYMEX price of Central Appalachian coal), and the heat rate of the competing natural gas plant is 7,000 btu/kWh (which is representative of about 30 percent of the existing natural gas fleet). We see that when the price of natural gas drifts below $2.80/mcf, then gas will displace coal capacities with heat rates above 11,000 btu/kWh, meaning roughly 17% of existing coal capacity (or 52 GWs) could be displaced. Of course, this example is specific to a coal price of $65/ton, but we can see in general that when gas price falls, we have the possibility to see substantial fuel switching.[8] If coal trades at price levels seen in the international marketplace in the last few years (over $130/ton), then the parity point for natural gas price to displace 17% of coal capacity rises to around $5/mcf.

If we see the price of natural gas regularly at a competitive advantage to coal in power generation then older units of the coal fleet will be retired. Initially, the existing natural gas generation fleet will pick up the slack, but eventually, new builds of high efficiency natural gas combined cycle units will be required. This raises the natural gas pricing point for parity because a greenfield expansion must include the cost of capital. However, when one also accounts for the environmental regulations

[8] Of course this is only a necessary condition. It may not be sufficient. For example, if contracted coal deliveries continue to pile into inventory, then the shadow value of coal will drop toward zero when inventory nears capacity. Then, coal-fired generating stations will operate even if the price of natural gas dips below this level. This is, however, distinctly a short run phenomenon.

that the US Environmental Protection Agency (EPA) seeks to impose via recent rule-makings, then the competitive balance shifts in favor of natural gas.[9]

Table 1: Summary of Impacts of EPA Regulations on U.S. Coal Capacity

Study Author	Regulation studied	Capacity Loss (GW)	Date by when Capacity Likely to be Lost
Edison Electric Institute[10]	All: CSAPR, MATS, NAAQS (Ozone rule), CO2 rule, Cooling water intake, clean water effluent guidelines, coal ash	76	2020
Energy Information Administration[11]	All	27	2016
North American Electric Reliability Corporation[12]	Slightly Stricter than MATS	6.5-9.9	2015
Committee for a Constructive Tomorrow[13]	MATS	17-60	2017
Brattle Group[14]	MATS	40-55	2015
ALEC[15]	MATS	15	2015
Department of Energy[16]	MATS, CSAPR	21	N/A
Institute for Energy Research[17]	MATS, CSAPR	34	2015
EPA[18]	MATS, CSAPR	9.5	2015

[10] J. E. McCarthy and C. Copeland, "EPA's Regulation of Coal-Fired Power: Is a "Train Wreck" Coming?" Congressional Research Service, August 8, 2011.
[11] "27 Gigawatts of Coal-Fired Capacity to Retire Over Next Five Years," Energy Information Administration, Department of Energy, July 27, 2012.
[12] J.E. McCarthy, "EPA's Utility MACT: Will the Lights Go Out?" Congressional Research Service, Jan 9, 2012.
[13] P. Driessen, "The EPA's Unrelenting Power Grab," Committee for a Constructive Tomorrow, 2011.
[14] S. Levine, "Natural Gas Demand and Environmental Policies," The Brattle Group prepared for the Northeast Gas Association Regional Market Trends Forum, April 13, 2011.
[15] "Economy Derailed: State-by-State Impacts of the EPA Regulatory Train Wreck," American Legislative Exchange Council, April 2012.
[16] "Resource Adequacy Implications of Forthcoming EPA Air Quality Regulations," Department of Energy, December 2011.
[17] "Impact of EPA's Regulatory Assault on Power Plants: New Regulations to Take 34GW of Electricity Generation Offline and the Plant Closing Announcements Keep Coming" Institute for Energy Research, June 12, 2012.
[18] M. Bastasch, "GAO Estimate May Lowball Effect of Coal Plant Regulations," *Daily Caller,* August 21, 2012.

Importantly, the EPAs recent rule-makings are focused on pollutants other than carbon dioxide. However, a displacement of coal by natural gas will have a substantial impact on US CO_2 emissions. Evidence of this was seen in 2012. The low price of natural gas encouraged significant fuel switching to natural gas away from coal, and US CO_2 emissions were the lowest they have been since 1992. In fact, according to the EIA, CO_2 emissions where 5,293 million metric tons in 2012 and 5,343 million metric tons in 1992. Moreover, this occurred without the EPA rule-makings in force, and the real price of electricity was on average lower in 2012 than in 1992, dropping

[9] The current rule-makings the EPA has made are all under various levels of protest in US courts. So, it remains to be seen exactly how binding the recent EPA actions may ultimately be.

from $0.1361/kWh to $0.1187/kWh on an average basis delivered to residential customers.

The above highlights a substantial opportunity for growth in natural gas demand, particularly if resource abundance translates into relatively stable and low prices of natural gas. Moreover, increased use of natural gas in power generation, particularly if it comes at the expense of coal, conveys desired environmental benefits. Government action on air and water emissions and mandated pollution control mechanisms will provide a substantial push in this direction.

LNG EXPORTS

A recent paper by Medlock (2012)[19] argues that the volume of LNG exports from the US will ultimately be contingent upon domestic market interactions with the international market. This is because US LNG exports will occur in a global setting, meaning the entire issue must be considered as a classic international trade problem. Only then will any insight be gained with regard to export volumes and thus US domestic price impacts. The paper goes on to argue that (a) the impact on US domestic prices will not be large if exports are allowed, and (b) the long-term volume of exports from the US will not likely be very large given expected market developments abroad. The bottom line is that the entities involved in LNG export projects may be exposed to significant commercial risk.

Much of this conclusion derives from a relatively straightforward analysis of domestic and international natural gas prices taking into consideration the effects of short term deliverability constraints. Indeed, the argument is made that the existing spread in prices between the US, Asia and Europe is transitory. Referencing Figure 4 can illustrate this argument. Specifically, spot prices in the UK, US and Asia all move together until the middle of 2010. At that point, the US price begins to drift below the prices in the UK and Asia. This is largely the result of growth in shale gas production in the US.

A significant break in the pricing relationship between Asia and Europe occurs at a specific date, March 11, 2011, the day of the disaster at Fukushima. The Asian spot price jumped by almost $2/mmbtu within a week and continued to climb through the end of the year with the closure of every nuclear power plant in Japan. This was the result of an unexpected demand shock as Japanese utilities scrambled to buy any available LNG for power generation. At the same time, the spread between the US and Asia was exacerbated by a negative demand shock in the US. Namely, the winter of 2011/12 was one of the warmest on record in the US, resulting in very low winter heating demands. As a result, natural gas inventories remained very robust and the market was oversupplied, leading to a price collapse to below $2/mmbtu in April 2012. As a result, the spread between the US and Asia rose to as high as $15/mmbtu. The interest in exporting LNG from the US also accelerated during this period. However, it is reasonable to expect Asian price to revert back to its pre-Fukushima relationship with European price as the current deliverability constraints subside—due to new supplies and reactivation of nuclear capacity in Japan. The LNG export opportunity looks a bit more sobering if that occurs.

Importantly, if we consider a longer term view of regional prices, we can begin to understand the potential risk in myopic decision making. Figure 5 indicates annual average price delivered to consumers in Asia, the UK and the US from 1980 through 2012. We can see from 2000-2008 the US price was rising, and it coincides with the period during which LNG regasification capacity was constructed with an aim to import LNG to the US. However, the period since 2008 is characterized by a wide divergence in regional prices, and this coincides with the emerging interest to export LNG.

One must consider the longer term price relationships because the recent past is not a prelude to the future. In fact, the 20 years prior to the 2000s is characterized by a relatively stable relationship between the regional market prices that saw Asian prices at a consistent but relatively small (to recent history anyway) premium to prices in Europe and the US. One must, therefore, question the nature of the recent divergence in regional prices.

The conclusion reached in the study by Medlock was one of very low export volumes from the US because the pricing premiums that exist today will not likely persist due to new supplies from a variety of sources as well as reactivation of nuclear reactors in Japan. In effect, the high prices in Asia encourage responses on many margins and thus result in a reduction in price. This follows from the adage, "the best cure for high prices is high prices."

[19] "US LNG Exports: Truth and Consequence" available at www.bakerinstitute.org.

CONCLUDING REMARKS—BRINGING IT ALL TOGETHER

All the information, when taken together, points to a series of cause-and-effect relationships that present challenges for some margins of response and opportunities for others. It will be surprising if "all of the above" actually results in a market-driven equilibrium. The traditional consuming sectors, specifically industry and power generation, face fewer obstacles because the mechanisms for demand growth—infrastructure and technology—are already in place. Natural gas into transportation may be a mixed outcome, with fleet vehicles—because they are high mileage vehicles—being the most successful in migrating natural gas into the fuel mix. Absent a policy intervention or a cost reduction, passenger vehicles still face hurdles to large scale penetration of CNG due to lower mileage.

The likelihood of demand pull coming from international sources in the form of LNG exports is high, but not in large quantities. This follows from the fact that US prices will likely rise to reflect marginal costs and international prices are not likely to remain at their current premiums. In fact, if the Asian price reverts back to its pre-Fukushima relationship with European price then the margin for profitable export of LNG from the US becomes razor thin. Thus, market forces will ultimately limit the volume of US LNG exports.

So, perhaps what is needed for demand growth for natural gas is a relatively simply prescription—economic growth. Economic growth stimulates demand for electricity and industrial goods, both of which favor natural gas. Moreover, as demands in these traditional sectors grow, this will create competition for supplies of natural gas for LNG exports and new demands. It is for this reason that the most likely demand for the robust supply of natural gas in the US will come from industrial and power generation uses. Transportation and LNG exports will likely remain marginal influences at best.

The CHAIRMAN. Well said doctor.

Mr. Gerard, welcome.

STATEMENT OF JACK N. GERARD, PRESIDENT AND CEO OF AMERICAN PETROLEUM INSTITUTE

Mr. GERARD. Thank you Mr. Chairman, Ranking Member Murkowski, and members of the committee. It's great to be with you today.

In the interest of time, I will abbreviate my statement consistent with your earlier counsel Mr. Chairman.

The invitation to join today is really an opportunity to talk about the game-changing opportunity that's occurring in the United States today, one that's unprecedented and that no one would've predicted just 5 or 6 short years ago. Today's hearing opportunities challenges natural gas is extremely timely in light of our Nation's emergence now as a super power in energy production.

This change in the global energy equation is due largely to technological advances in the extraction of natural gas and oil from shale formations. These technologies, though they have been around for many years, are now being improved dramatically in driving America's 21st century energy renaissance and have the potential to benefit our Nation well beyond what we might consider traditional energy policy. In the words of Pulitzer Prize winning author, Dan Yergin, just last week he said "this is the most important energy innovation so far of the 21st century."

Recent research shows that in the upstream segment of the oil and natural gas industry, and I want to emphasize this is just in unconventional production of natural gas, we today support 1.7 million jobs. That number is expected to grow to 2.5 million jobs by 2015, 3 million jobs by 2020, and 3.5 million American jobs by 2035. According to the Bureau of Labor Statistics, jobs in the oil and natural gas industry, exploration of production sector pay on

average more than $100,000 per year, more than twice the national average. These are good jobs that our economy desperately needs.

Currently the entire natural gas and oil industry today in the United States supports 9.2 million jobs, we're responsible for 7.7 percent of our gross domestic product, and we contribute $86 million a day to the Federal Government.

In addition to job creation, unconventional natural gas and oil paid $62 billion in Local, Federal, and State taxes in 2011. By 2020, this number is expected to grow to $111 billion.

On a cumulative basis, unconventional natural gas and oil activity is expected and projected to generate more than $2.5 trillion that's a T, 2.5 trillion in tax revenues between 2012 and 2035.

We should remember, this isn't happening in just a vacuum. The world is watching us and understands that decisions you will make as a committee, and more broadly the Congress, could literally alter the geopolitical energy dynamic of the world.

Case in point, LNG exports which will create thousands of U.S. jobs, generate billions in additional revenue, improve our trade deficit, and spur major investment in infrastructure, all while improving our energy security.

Additionally, the increased use of natural gas is critical to reducing carbon emissions, which many have spoken about already today. In fact, as mentioned earlier, carbon emissions are at 1992 levels due largely to natural gas.

The question before us is not whether we have the energy to grow and to prosper. We clearly do.

The question is whether we have the political wisdom and foresight to create a national energy policy that harnesses our great potential as literally an energy super power.

We look forward to working with you to make this potential a reality. This hearing is a good start in that process.

Thank you very much Mr. Chairman for the invitation.

[The prepared statement of Mr. Gerard follows:]

PREPARED STATEMENT OF JACK N. GERARD, PRESIDENT AND CEO OF AMERICAN PETROLEUM INSTITUTE

Good morning Chairman Wyden, ranking member Murkowski and members of the committee. Thank you for the invitation to join you as we consider the game changing energy opportunity before us resulting from our abundant domestic natural gas supply.

My name is Jack Gerard, president and CEO of the American Petroleum Institute. We represent all aspects of the oil and natural gas industry with more than 500 members who supply most of the nation's energy.

Today's hearing, "opportunities and challenges for natural gas," is extremely timely given our nation's emergence as a global energy leader. This change in the global energy equation is due largely to technological advances in the extraction of natural gas and oil from shale formations. These technologies are driving America's 21st century energy renaissance and have the potential to benefit our nation well beyond traditional energy policy.

In the words of Pulitzer Prize winning author Dan Yergin, "[this is] . the most important energy innovation so far of the 21st century."

Recent research shows that in the upstream segment of the oil and natural gas industry alone, unconventional natural gas production supports 1.7 million jobs. That number is expected to grow to 2.5 million jobs by 2015; 3 million jobs by 2020 and 3.5 million jobs by 2035. According to the Bureau of Labor Statistics, jobs in the oil and natural gas exploration and production sector pay on average more than $100,000 per year, more than twice the national average. These are good jobs our economy desperately needs.

Currently, the entire natural gas and oil industry supports 9.2 million U.S. jobs; accounts for 7.7 percent of the U.S. economy and delivers $86 million per day in revenue to our government.

In addition to job creation, unconventional natural gas and oil paid $62 billion in local, state and federal government taxes in 2011. By 2020, this number is expected to grow to $111 billion. On a cumulative basis, unconventional natural gas and oil activity is projected to generate more than $2.5 trillion in tax revenues between 2012 and 2035.

And we should remember this isn't happening in a vacuum. The world is watching and understands that our decisions could alter the geopolitical energy equation for generations.

Case in point are LNG exports, which will create thousands of U.S. jobs, generate billions of dollar in revenue, improve our trade deficit and spur major investment in infrastructure, which will strengthen our energy security.

Additionally, the increased use of natural gas is critical to reducing greenhouse gas emissions. In fact, U.S. carbon emissions are at 1992 levels due largely to increased use of natural gas in the generation of electricity.

The question before us is not whether we have the energy we need to grow and prosper. We do. The question is whether we have the political wisdom and foresight to create a national energy policy that harnesses our great potential as an energy superpower. We look forward to working with you to make this potential a reality.

This hearing is a step in the right direction. Thank you for your time and attention.

The CHAIRMAN. You get the record for the shortest testimony, and——

Mr. GERARD. Thank you.

The CHAIRMAN [continuing]. We thank you.

So we're going to have votes in a few minutes.

I'm going to ask just one question to each of you. Senator Murkowski, we'll get as many colleagues in as we can, and then we're going to break probably around 11:15.

Here's my question for each of you that's willing to comment. I think you heard Senator Murkowski and I both talking about the importance of working in a bipartisan way. That's what it's going to take in order to get anything done. What I'd like is to, in effect, assess your views on one issue and that is: Is there a way to a natural gas policy where America can have it all? Economic growth, lower emissions, cheaper power, and reduced trade deficits certainly are what come to mind. What would each of you recommend that the committee do in order to have it all, in effect find that sweet spot where we can attain so many of these important objectives to the country? Why don't we start with you Governor?

Governor HICKENLOOPER. That's certainly no easy question.

Again, I come back to the notion of regulation—appropriate regulation, and my own inclination, obviously being a Governor and knowing there are enough former Governors up there is that States are the laboratory of democracy and that we are focusing on how do we create a rigorous set of regulations that will be—I mean we steal from each other every day, and I think the Federal Government Lisa Jackson at EPA's been a great partner with us in terms of trying to push us further and trying to figure out where those sweet spots are by using some of the technical expertise that she has had at her disposal. But I think that that's going to take a, you know, certain amount of time although we should have our full regulatory environment together within—by the end of this year, and at that point we're still doing testing and measuring the air pollution issues and air quality around these large fields, trying to push our large companies to do less trucking back and forth, more pipe-

line transfers, to convert more of their diesel operations to be fueled with LNG.

I—One of the large exploration companies, Noble Energy in Colorado, they're based out of Houston, but they are now building their own LNG plant in Colorado so that they can sell it and run these operations in a more clean fashion.

The CHAIRMAN. If I can get some others in, Mr. Liveris.

Governor HICKENLOOPER. Yes.

Mr. LIVERIS. Yes, Mr. Chairman.

I had mentioned the quadruple win. We believe that if the American public benefits and we get the benefit of jobs from exports and domestic manufacturing, America can be an energy and manufacturing super power.

All you have to do is follow the current law of the regular regime that exists, which is—look at the public interests with each application, take a cautious approach.

Our numbers suggest somewhere between 5 and 8 bcf a day should be what we see in this first little while while we're in the fifth year of these great energy finds.

I think we also have conversations around responsible regulations.

We should have a con-responsible supply and making sure demand and supply don't get out of check like they did 10 years ago.

We should not let the market, call it the speculators, call it Wall Street, call it the financial world, set the price domestically because as we all have seen with commodities like oil, that price is set in the main by financial markets as much as real supply and demand.

So there is a way to have it all, I believe.

The CHAIRMAN. Very good.

We were just given a reprieve for 15 minutes. So we're going to go until 11:30. Then we'll take a break.

Mr. Eisenberg.

Mr. EISENBERG. Thank you.

I think this committee is taking a very thoughtful approach to the issue.

I note this is not the very—it's not the first time this committee's had a hearing on the issue of LNG exports. I mean you did this 14 months ago.

You're taking a very thoughtful and cautious approach to try and understand all of the challenges.

If I could focus on one thing, it would be permitting. In my written testimony, and I'll walk through it a little bit again, I talk about some of the hoops that you really have to jump through to actually get an LNG export facility up and running.

So not only the DOE license is not the final hoop that they have to jump through here. They have to engage in a very, very broad environmental review of their project led by FERC.

Compliance with NEPA requires that the developer acquire the land and begin design engineering plans. That takes about 2 years. Then NEPA requires the input of up to about 20 Federal and State agencies, including the Army Corps for dredge and fill permits, which we know can be very controversial; a waterway suitability assessment from the U.S. Coast Guard; air permits from State and

EPA agencies; and then the usual State and Local construction permits.

If they can somehow get through that and get a final EIS, then you can be sued for 6 years.

If you can somehow get through that, then you have to get the long-term financing in place and you have to get contracts in place. Then when you get the contracts in place, then you have to go find $10 billion to go building a facility.

This is not an easy process.

I really recommend to try and take on some real legislation to try to make the permitting process work faster.

The CHAIRMAN. Let's do this Ms. Beinecke and for each of you, understand the tradeoffs because if we all just go back to our positions, then it's going to be hard to find the sweet spot.

Ms. Beinecke.

Ms. BEINECKE. Senator I think that one of the key issues is gain—how you gain public confidence, and I think having minim Federal standards and public disclosure of chemicals.

There—right now there in the 30 States in which fracking is occurring. There's only chemical disclosure in 14, and those States vary considerably.

So in order for natural gas to provide the benefit that my colleagues on this panel have identified, you have to figure out how you're going to assure the public that their health and that their well-being is protected, and there need to be minimum Federal standards that provide that, and they don't exist now.

The CHAIRMAN. Very good.

Mr. Medlock.

Mr. MEDLOCK. Yes, well, I actually second what Ms. Beinecke just said with regard to Federal standards.

The one place I think the Federal Government could actually have a very active role is in promoting transparency. I think that's something that is lacking, with the exception of a few States where certain States have actually taken initiatives to make sure transparency regulations are put in place.

The other thing, and I'll shift gears here, that I think could really help benefit an all-of-the-above kind of outcome is to allow markets to do what they do, what they've always done. They've actually resulted, as I mentioned in my testimony, in a very efficient natural gas market in this country, and it's hard to imagine anything that would be adopted that would disrupt that.

But one thing that we need in this country that would really benefit, not only the immediate-term, but in the long-term, is the ability to store electricity. If we get to that point, it actually changes the entire landscape of the energy infrastructure in this country and would convey a lot of benefits associated with renewables, associated with natural gas, associated with nuclear power that we simply can't reap right now.

The CHAIRMAN. You're spot out on storage. I'm over my time.

Mr. Gerard, just if you——

Mr. GERARD. I'll be brief. The first thing we can do is remember how we got to where we are today. In a very real way we are today at a sweet spot.

We got here because of market conditions and the free market brought us to the point of $3 gas when it was $14 gas just 4 or 5 years ago.

So the worst thing for us to do, and this is just where I take strong exception with my friend Andrew, is to get government involved in trying to set the price and trying to control the market.

The market will sort this out and find the equilibrium.

We will from that we benefit from the improved environment with lower emissions, having low cost, affordable natural gas.

We'll generate 2 million jobs, we'll generate $2.5 trillion in revenue to the Federal Government, all while finding the opportunity to literally have it both ways in terms of exports and domestic production.

The CHAIRMAN. Very good.

Senator MURKOWSKI. I'm just going to continue on the discussion of exports. Several of you have raised the fact that there are multiple applications pending right now. There are 18 that are for export to non-FTA countries and 3 that are for export to FTA countries.

The suggestion has been, and not necessary with this panel but out in the public discussion that somehow or other if all these applications were to be approved, all of a sudden we wouldn't have access to the natural gas in the volumes and the quantities that we would hope for this manufacturing renaissance.

I think it was you, Mr. Eisenberg, that noted some of the difficulties.

I noted in my opening comments that we're talking about billions of dollars to build out the infrastructure. Was over in Japan a couple of weeks ago. They're looking at our prices somewhat with envy, but when they account for the transportation costs and the liquefaction costs, at the end of the day there's not that much difference between what they're currently paying and what they might pay if they were able to take benefit of export from the United States here.

If I can ask, and Mr. Liveris you had mentioned that potentially we could see half of our natural gas being exported if, in fact, all of these applications were to be approved. The question is: Do any of you believe that we will be in a situation where we will see a dozen export applications approved in this near term?

I throw it out to any of you, given the cost, given the need for long-term contracts with other Nations, and the need to obtain financing.

Mr. Liveris.

Mr. LIVERIS. I would actually firstly agree with my good friend Jack, assuming we're friends, the conversation about adding jobs is what we should be having 2 million plus 5 million, not 2 million or 5 million.

I think this conversation is seen before.

None of us get the gas price right. Five years ago we had it wrong. We were building import terminals. Five years from now, what's it going to be?

How many terminals should the public interest demand?

What is the public interest here?

It is to get volatility and instability out of an energy price.

We care about agriculture here in this country.

We care about defense.

We should care about energy. This opportunity to get it right by doing both in the public interest means we should take a crawl-walk-run approach to how many terminals we approve and how many of these occur over time.

As I said in my testimony, we're in the fifth year of our 100-year advantage. You can't move factories overnight, to state the obvious.

Why put at risk the 5 million jobs, the $96 billion worth of investment that are on the books today? Over 60 companies, why put that at risk by doing either or? Why transfer the risk?

So be cautious, do what the public interest demands and the DOE application process.

I agree, financing will be difficult.

I agree, prices will be volatile.

But why take the risk and let the speculators set the gas price like they did 10 years ago, and we all remember the Enron's and what the efficient market did for us 10 years ago. It was hardly efficient. OK. It was very inefficient.

Senator MURKOWSKI. We can talk about whether or not the public interest determination includes the specific criteria that we need to look at. I think that's going to be an important part of it.

I have suggested, too, that we need to be very thorough in the review. You don't just willy-nilly grant applications. These all need to be recognized for what they might provide.

Governor, I want to take the balance of my time to talk to you because I am interested in what Colorado has done in terms of your leadership with the State's regulatory system. You indicate that Colorado could be this national model. You speak very highly of what you've been able to accomplish in terms of the balance.

I happen to believe that the other States should be models just as Colorado is a model and, again, as a former geologist or a recovering geologist, however you recognize yourself, that in your State and in your region you want to make sure that things work for you.

I guess my question to you is: Given that you feel pretty comfortable with your State's regulatory system and what you have built there, do you think that we need new Federal rules on top of what Colorado already has in place to provide for further levels of safety or assurance or does it add another layer and perhaps an unnecessary regulatory layer?

Governor HICKENLOOPER. Historically the way the regulatory environment traditionally works in this country is the States are the laboratories, and we are now—there are other States that are aggressive in creating their own integrated and comprehensive regulatory environment, and we—for the National Governors Association, you former Governors know how competitive Governors can be. But we also collaborate.

So I—the Republican Governor, Mary Fallin, from Oklahoma, she and I went to Detroit last June to try and convince car manu-automobile manufacturers that they should do more compressed natural gas vehicles right off the assembly line.

At the same time, we're looking at how do we take our regulatory environments and have those 30 States where we are facing the issues of innovation technologies in horizontal drilling and hydrau-

lic fracturing, and how can we work together to create a template where we would have sufficient flexibility to respond to the different environments in different States, different depth of the shale, the different quality of the rock, but at the same time allow us to move toward some level of Federal regulation.

So I think ultimately we will get to that Federal regulation.

I want to make sure that the States work together in terms of making sure we don't put one State or another at a disadvantage.

Senator MURKOWSKI. So then, in addition to what you already have within your State, you think that additional Federal regulation on top of that is a wise thing?

Governor HICKENLOOPER. I think what would happen Federal regulations would probably be modeled after a group of States. It wouldn't be in addition to.

They would—we talked to Secretary Salazar when he was with the Interior in terms of what the appropriate regulation would be for BLM land. What we came up with was Wyoming, Colorado, Utah all have fairly strict transparency rules around frack fluids, some of the same basic regulatory environments, very aggressive about escaped fugitive methane. We got to the point where, and we haven't done this yet, but we're talking about having one application form that you would send if you wanted to drill a well in Colorado or Wyoming on BLM land. It would be the same form that you send in to the State. So you send the same form to the Federal Government as to the State. So that—I mean, isn't that the ultimate goal?

We're trying to get different States and the Federal Government to work together so we cut the red tape and yet still maintain a very, very, very high and rigorous set of regulatory environments.

Senator MURKOWSKI. Chairman, I'm well over my time, but it seems to me that we're talking about regions, not necessarily one level of Federal overlay.

But I'd like to pursue this conversation further with you if I may.

The CHAIRMAN. Very good.

Unless things change now, again, we will go until 11:45, then we're going to have 2 votes, and then we'll take a break and will come back.

Next in line is Senator Udall, and then Senator Flake is after Senator Udall.

Senator UDALL. Thank you Mr. Chairman, again. Welcome to all of you on the panel.

I want to turn to my Governor who provided an initial, very insightful summary of what's happening in Colorado.

We have seen a big economic boost from the current oil and gas boom, as the Governor mentioned.

It's also brought some challenges. In our neighborhoods and communities we've seen additional drilling and concern from our citizenry. I think the Governor and I both believe that there's a great economic opportunity here, but our No. 1 priority is to protect the health and well-being of our citizens.

We hear a lot about fracking and drilling, and there are some efforts underway that have been challenging in Colorado when it comes to those communities? rights versus the State's rights versus the industry's rights.

Governor would you speak, because I know you're going to field—and have already—some questions on how we balance all of this, but speak in particular of the fugitive emissions questions that have been raised?

There was a study that the EPA released last week that concluded that oil and gas operations are the second largest emitter of methane in the country. You've spoken about the need to eliminate fugitive methane emissions, so we can get that full environmental benefit.

Would you share with the committee what your vision is for how we do that and what the industry's been saying to you in Colorado?

Governor HICKENLOOPER. Sure, and thank you Senator for your balanced approach on all of this.

I'm sure you senators all know this, but there's no one who's climbed more mountains, I mean real mountains, in terms of their life and at the same time recognizes and tries to balance the needs of our communities for jobs and commerce so that we can protect our natural environment at the highest level but still focus on the realities of day to day life.

You know the issue around methane is crucial because it is—fugitive methane is very harmful to our environment and even as you burn gasoline, you know compressed natural gas is cleaner than gasoline, but if you allow fugitive methane to escape from where it's collected and then during transportation and more importantly where it is put into vehicles or used by end, whether it's commercial facilities or wherever, if that's escaping, we lose much of the environmental benefit.

The one beauty of this is you don't have to push industry too far to let them recognize this is something that they can sell. Right? This is something that they can value and that a higher level of regulatory oversight to make sure that they're—that we measure fugitive methane really allows them to benefit long-term by making those infrastructure investments.

We have—we're doing a $1.5 million project right now through Colorado State University. We're going to go out to a couple of our largest fields, but eventually within 2 years we will have measured the air quality at different times of the day at different seasons in most of our major oil producing parts of the State so that we can actually demonstrate what are the real, not just the estimates, but what are the real consequences of this and how much methane is escaping and get ourselves back down to a zero tolerance.

Most of the responsible oil and gas producers recognize the imperativeness, and they willingly accept that regulatory environment.

Senator UDALL. Thank you Governor.

If I might, I'd like to ask Ms. Beinecke for her thoughts on fugitive emissions. I know, Frances, you've really taken a close look at this and——

Ms. BEINECKE. We have Senator, and thank you for asking.

Our concern is—I mean we have concerns about all the air emissions coming from natural gas. Methane is of particular concern because of its potency as a climate-forcing emission. So we think that the measurement that's going on now, trying to find out where the methane is leaking from, putting forth the technologies to stop it

as quickly as possible is absolutely imperative to protecting the climate.

We're also concerned with the other air emissions coming from fracking, particularly coming from the trucking operations—diesels.

There are people all across the country who are concerned about what they're being exposed to. They don't know exactly.

We need ongoing air monitoring, and I'm happy to hear the Governor saying that that's going to be something Colorado is going to be doing because there's a huge gap between the information that the public has and what is happening in their own communities and until we, as a country, take that on and address it head on, there is—there just a huge conflict between the opportunity that people hear of identified with natural gas and the concern that people have about their health and well-being in their own homes.

I'm just saying that that is growing so quickly across the country.

We hear from people each and every day, and just a poll that Bloomberg did in January shows that 66 percent of people in the country wanted stronger protections from fracking and that went up from 55 percent in September.

So, this is an issue that is really exploding in the public mind, and they need to know that you will all take on their concerns and put in place those safeguards that will assure them that they're protected in the future.

Senator UDALL. As the Governor pointed out, these are industrial processes, and we've all become comfortable with the industrial zones around our cities and wherever they may be located. But when these industrial processes come to people's backyards and school yards and community areas, it really drawns people's attention.

I know my time's expired.

I want to, for the record, thank the Governor for his comments about my mountain climbing exploits, but I also wanted to be clear that the great French climber, Lionel Torrace, said that climbers are conquistadors of the useless.

We'll leave that there, but I did want to comment on natural gas exports. I think there's real potential when it comes to exporting natural gas, as long as it doesn't come at the cost of our land, our water, and our air, or consumer energy prices.

I want to keep exploring the national security implications of exports, especially to our NATO allies. I think there could be a real benefit. I sit on the Armed Services Committee, as well as the Intelligence Committee, and I believe there's more to this question that we ought to discuss, and I look forward to continuing that conversation.

There's real geopolitical ramifications of this Shale Gale that we now have available to us.

So, again Mr. Chairman, thank you, Ranking Member Murkowski, thank you.

The CHAIRMAN. Thank you Senator Udall.

Senator Flake.

Senator FLAKE. Thanks.

In the interest of time, I'll just ask one question. Mr. Liveris in your testimony you note the competitive advantage to American in-

dustry by maintaining affordable gas prices. I think we all agree with that. You talk when you look at Dow's online policy statements, they will tout the benefits of a competitive open market, particularly as it pertains to exporting chemicals. Why do open markets work there in driving down price and benefits to everybody, but they don't in terms of producing natural gas and export of natural gas?

Mr. LIVERIS. I'll try and be brief.

It is a complex conversation.

Number 1, open markets we are very much for.

We are for exports, we are for balanced exports, so we don't lose competitive advantage domestically.

Gas, as already noted, has to be liquefied and shipped at billions and billions of dollars. That is not an open market, that's a point to point contract. There's probably 30 of these contracts around the world from nation states to nation states.

Not all go to free market NATO allies. These are countries that need gas because they don't have oil. They—actually their equivalent is to import oil. That's why there is a national security interest.

But to take gas and actually export it as a primary-10 producers in the world that are gas rich, only one of them chooses to disadvantage the domestic sector by not looking at the efficiency of the domestic market because it takes so much to make this shippable versus in oil. OK? You actually can leave it home in an efficient market home.

So how do you actually balance how much of it goes offshore versus home is a conversation that should be in a conversation like this.

Domestic manufacturers in places like Saudi Arabia, in places like Russia, who actually have top-down policies say I'm going to keep the gas home to diversity my economy away from just being exposed as an oil exporter and a gas exporter in their 2 cases.

In a free market democracy, we need to get the balance of all stakeholders to the table, but recognize that this is not a commodity world price yet. One day it might be. There may be enough LNG traders that's why I disagree with this market of LNG being 30 BCF a day.

If the world energy market is the gas market, the gas will substitute the oil.

The gas will substitute the coal.

The gas will substitute ultimately nuclear where nuclear is not allowed.

So it's the world energy market that this serves. Therefore, it's fairly infinite in that sense.

So you've got to be careful you don't let the current world energy price, which is oil, set the domestic gas price as an unintended consequence.

So, crawl-walk-run. Let some of this occur. Let the BCFs go up. Let it rise as supply rises with responsible regulation. Let's look at the public interest and the effect on the domestic competitiveness in both the consumer and the industrial user. Let's get both of them.

That's my quadruple win.

Senator FLAKE. If I understand right, Mr. Gerard, you're saying that the best way to let that happen, to find that balance, is to let markets to do that. Is that correct?

Mr. GERARD. Absolutely.

In fact, Senator when you look at the reality of what we're dealing with today, there's already about 37 to 40 bcf a day capacity that exists in the world. The expectation between now and 2025/2030 is that the entire market for LNG is going to be in the 50 to 60/65 bcf.

The amount that we're talking about in the U.S.'s potential proposals or permits is about 30 bcf.

The potential additional build across the world is 50.

So if you look at all of the proposal to export LNG today, you've got 114 bcf potential trying to satisfy a 50 bcf a day market.

The amount that would leave here, and most of the studies show, at most perhaps 5 to 6 bcf.

The natural gas industry increased our production in the United States by 6 bcf in 2 years in the United States, and we're just at the verge of figuring out how to further be more efficient to produce even greater volumes.

The likelihood of this having any significant impact on price, in fact all the other independent studies have done show somewhere between 2 and potentially 11 percent impact on price, is highly unlikely.

It's the market that brought us here today.

The market will continue to drive the price down.

The other added advantage is we're creating jobs in this country, great paying jobs, as we try to fulfill the demand on a global basis. We shouldn't overlook that, and we're really at an opportunity to change the equation.

We're now the largest producer of natural gas in the world, surpassing Russia. It's a great opportunity.

We shouldn't go slow and let that market dissipate because it will be filled by others around the world, and we're putting at disadvantage our own Americans and others who are prepared to risk market capital and to build the facility to export the product.

Senator FLAKE. Thank you, Mr. Chairman.

The CHAIRMAN. Senator Franken.

Senator FRANKEN. Thank you Mr. Chairman.

Natural gas has contributed to lower U.S. emissions, which is great, but oil and gas production is still the second biggest contributor to greenhouse gases and eventually we need to shift more emphasis to renewables.

When this committee heard testimony from former Lockheed Martin CEO, Norman Augustine, on a report by the American Energy Council, we were told that the country has yet to embark on a clean energy innovation program deserving of the priorities that are at stake.

Part of that is because my colleagues often criticize government support for renewables. They believe it is only the marketplace that can determine which technologies will become relevant.

But the history of fracking tells a very different story.

The Breakthrough Institute has looked extensively into this. They've examined the Eastern Gas Shales Project which was an

initiative of the Federal Government back in 1976 before hydrofracking was a mature industry. The Project set up dozens of pilot demonstration projects with universities and private gas companies testing, drilling, and fracturing methods.

This was instrumental in the development of the commercial extraction of natural gas from coal.

Other tool used in fracking, microseismic imaging, was originally developed by Sandia National Laboratory, a Federal energy laboratory.

The industry is also supported through tax breaks and subsidies. In fact, according to former Mitchell Energy Vice President Dan Stewart, Mitchell Energy's first horizontal well was subsidized by the Federal Government. Mr. Mitchell said in an interview, and I quote, DOE started it and other people took the ball and ran with it. You can't finish DOE's involvement.

Anyone here but Mr. Gerard, Mr. Medlock do you agree with Mr. Stewart that you can't dismiss DOE's role in the development of this technology?

Mr. MEDLOCK. I'm actually 100 percent with that. It's actually a point I've made many times in talks that I've given. I think it's actually remarkable how the foresight that was demonstrated by the Federal Government back in the 1970s to actually initiate the Eastern Gas Shales Project because it didn't pay off in 5 or 10 years. It took over 30.

Now we're sitting in the midst of talking about what should we do with this abundance of natural gas, and it owes its roots to Federal Government programs, so I don't disagree with that at all.

Senator FRANKEN. I just want to emphasize that because we hear this so often. But then if you look back at the actual history of this, this thing that we celebrate now, this abundance of natural gas came from the expenditure of Federal dollars.

We need to do the same thing when it comes to renewables.

Governor.

Governor HICKENLOOPER. Senator, I think you're right on point, and I know some of those guys from Mitchell Energy, and they are the first to recognize over the 1980s—I remember that I think it was 1982 and 1995 that the Federal Government invested over $5 billion in terms of trying to create this ability to extract shale gas from tight shales and to get oil from tight shales.

Simultaneously, I think also we have to recognize that renewable energy such as wind and solar is intermittent and certainly as we are faced with challenges on storage we need ways to be able to have electrical energy generation go on and off efficiently.

Natural gas does that at a level that literally almost no other energy can do, so it becomes a perfect partner for solar and wind.

I think it will prove to be the transition energy that will allow us eventually to get to a fully renewable energy environment.

Senator FRANKEN. Thank you Governor.

Since I have you, I just want to talk to you a little bit about, and I'll do this very quickly because I'm running out of time, the 2005 Energy Policy Act exempted underground injections associated with fracking from Federal Safe Drinking Water Act jurisdiction.

The only exemption was from fracking fluids that used diesel.

Now we've had concerns over groundwater contamination that have been raised, even documented by EPA in places like Pavilion, Wyoming.

You've developed regulations in your State that include disclosure of chemicals that are used. Have these regulations prevented your State from sustaining a strong natural gas industry? I think I know the answer, but I want to ask it.

Governor HICKENLOOPER. No, not at all.

But I think the key there is to make sure that all the actors are at the table and so that as you're recognizing one of the real issues when we sat down with executives from Halliburton, they have a frack fluid that is made out of food additives. You can drink it.

We did drink it around the table, almost ritual-like in a funny way, but it demonstrated——

Senator FRANKEN. Like a pact.

Governor HICKENLOOPER. Not like a pact.

It was a demonstration. We had environmental——

Senator FRANKEN. Oh.

Governor HICKENLOOPER.—representatives. We had industry representatives—everybody around the table.

Senator FRANKEN. It was not like an occult?

Governor HICKENLOOPER. Not an occult.

Senator FRANKEN. OK.

Governor HICKENLOOPER. No, there were no religious overtures——

Senator FRANKEN. Yes.

Governor HICKENLOOPER.—in any sense.

But I think the key was that there—that that was more expensive that they've invested millions of dollars to create what is really a benign fluid in every sense. It doesn't have benzene or any of the other components that we generally get from crude oil or hydrocarbons.

So, but if we were not a—if we were overly zealous in forcing them to disclose what they had created, they wouldn't bring it in to our State.

So it was an alignment of self interest to make sure that we had a regulatory environment where they could protect their investment in their intellectual property but at the same time be sufficiently transparent so that the Marmel Defense Fund, the NRDC, the representatives of environmental quality were willing to say this is sufficiently transparent to—we know we understand what's being pumped into the ground.

The CHAIRMAN. I don't want to be Draconian, but we have a number of Senators who are trying to get in before the break.

Senator Franken, I'm going to follow up with, though, because you're making good points.

Senator FRANKEN. Thank you Mr. Chairman.

The CHAIRMAN. Senator Lee.

Senator LEE. Thank you Mr. Chairman, and thanks to all of you for coming.

I appreciate your testimony and the thoughtfulness with which you've addressed each of these issues.

I've got a few questions. I'd like to start with Mr. Liveris, if I could.

In your testimony you suggest that increased exports are likely to bring about upward price pressure on natural gas.

But it appears to me that you may not have taken into account the impact that Mr. Gerard referred to a few minutes ago, the impact that would result from increased demand resulting in higher prices resulting in increased production activity. Plus, and likely in more production of natural gas, perhaps enough to keep the price of gas even, or close to even.

Is it—is that a correct characterization that Mr. Gerard made, that we need to take that into account?

Mr. LIVERIS. So, I made several points.

Firstly, the world market for gas does not exist; it's a world oil price.

The world oil price is currently $117 Brent.

It's got nothing to do with the cost of world production.

It's got nothing to do with the actually the affordability of oil around the world.

It's got everything to do with speculation and geopolitics.

Before you index the domestic gas price to the world oil price domestically and this up-swirl that Mr. Gerard refers to, which is why you want to export in the first place, I said we are for exports.

But we should be very careful that we don't do what is called Dutch Disease. Economic theory brings back the highest price back to your domestic sector with unintended consequences.

Be careful of unintended consequences.

Have the production.

Have the exploration.

Gas prices should rise from where they are today.

They putting in-locking in wells because the gas price is too low.

We fully expect domestic gas prices to rise, and that's not even a question of——

Senator LEE. You're OK with that?

Mr. LIVERIS. Of course, of course.

Senator LEE. Some of this is going to have——

Mr. LIVERIS. There should be a return for everyone here.

A return for the people who have taken the risk.

A return for society.

Let's use some of this bounty and transition to a low carbon economy, as Senator Franken talked about.

We're for an all-of-the-above energy strategy.

Let's use natural gas as a transition for our economy first. Let's let that up swirl occur as a reasonable return for everyone and for American manufacturing jobs and the American consumer.

That's a thoughtful approach to how many of these applications to approve.

Senator LEE. OK, so this is what you are referring to on page 6 of your written testimony then when you refer to the need to promote and enforce policies that would keep prices at reasonable levels.

I think reasonable was the term you used.

Mr. LIVERIS. Absolutely.

Reasonable meaning to cover the risk of everyone in the value chain, including the explorers, including the entrepreneurs, includ-

ing the producers, but including society that needs smart regulations so as to produce responsibly.

Senator LEE. OK. One person's conception—one person's concept of what is a reasonable price might be different than another's.

Mr. LIVERIS. Clearly.

Senator LEE. Who gets to decide that?

Isn't that a highly unavoidably subjective standard?

Mr. LIVERIS. Senator, you would agree that if I go to a completely different world, the world of agriculture, who sets world food prices? Does the agricultural sector from every country follow everyone's rules?

There is rules-based free trade in everything we do, including my products.

I have standards in Japan I can't meet because the government of Japan sets that standard so I can't export anything from here into Japan.

The oil industry's quite familiar with that.

Senator LEE. OK, so you——

Mr. LIVERIS. Who sets the rules is where everyone has to be at the table and figures out what the right rule for free trade is.

Senator LEE. OK, so everyone's at the table and they do make their arguments.

But you're suggesting a system in which the rule would ultimately be made by the Department of Energy, and you suggest that the Department of Energy should implement a rulemaking process that would require the Department of Energy to analyze a comprehensive list of criteria before they approve any LNG export?

That one of those criteria ought to include an identification by the wood-be exporter of any jobs that might be lost in the manufacturing industry, is that right?

Mr. LIVERIS. So the current law, the public interest criteria in the Department of Energy is our law, your law, everyone's law.

You set the law.

So the regulatory regime has worked in the past by doing it right.

This is a new found bounty. The criteria should be all-of-the-above: responsible production, does society benefit as a whole, and is job creation something that is additive here, can we get job creation in the oil and gas sector and the manufacturing sector, and I think that should be one of the criteria that the gov-DOE looks at.

Senator LEE. Should——

Mr. LIVERIS. I'm not suggesting——

Senator LEE [continuing]. Anyone who wants to export anything from the United States also be required before exporting it to prove to government officials that it wouldn't cost any jobs in any other industry in the United States?

Mr. LIVERIS. I didn't actually answer you by saying it should be jobs only.

It should be all of the criteria:

Senator LEE. But that should be one of them?

Mr. LIVERIS [continuing]. Food security, national defense, and energy security, in my view, are national interests.

So the DOE has public interests for some reasons, and I would imagine the national interests being at the highest hierarchy. The national interests includes lots of things, of which job creation is one of them.

Senator LEE. OK. I see my time's expired.

Thank you very much Mr. Liveris. Thank you, Mr. Chairman.

The CHAIRMAN. Thank you Senator Lee.

Senator Stabenow.

Senator STABENOW. Thank you Mr. Chairman.

I want to talk more about exports, but I do want to start by agreeing with Ms. Beinecke that we've got to make sure we have the public confidence and the safeguards in place to make sure that this—that this actually can be done in a safe, responsible way.

But I do want to follow up as we talk about public interests.

I find it interesting conversation that we—that there's some surprise about talking about the need to not only export a new natural resource that's—we have now, that is an incredible opportunity, but also weighing how we leverage that, keep it at a reasonable cost basis in order to create American jobs.

It seems to me that's what our job is to do, is to find that balance to be able to do that.

When we look at what the DOE is looking at right now in terms of their studies and so on, I would follow up. Mr. Liveris you talked about the 100 new projects that have been announced at a value of over $95 billion and that if we keep natural gas affordable, we're looking at 5 million manufacturing jobs and that's certainly something that seems to me would be of significant importance in this economy as we're trying to turn around, and manufacturing has really been inching along leading the way.

But when we look at the study that the Department of Energy has used, to your knowledge did it include the 100 new projects and if not, how would that affect the reliability of that study?

Mr. LIVERIS. Yes, we thank you Senator Stabenow.

The study did not include the $96 billion of projects that are now on the books. It actually used the EIA re-Demand Scenario as of 2010–2011.

These projects were not on the books in States like Senator Landrieu's State. By the way, happy Mardi Gras Senator Landrieu.

We definitely feel that this study should be reexamined. It's not just us that said it's flawed. Many people have looked at it and said this is a part that needs to be upgraded.

By the way, I think that we should do 2 or 3 or 4 more studies and get everything on the table. I think that's the whole discussion we're having here because one study does not make a strategy. OK. One study does not make the decision.

I think we have lots of inputs to this decision, not the least of them being making sure we have responsible supply.

Senator STABENOW. Would you discuss a little bit more what you think is missing from the DOE approach at this point. What more would you like to see considered in the broad consideration of what we should be exporting and the approvals of the export terminals?

Mr. LIVERIS. I think it's trying to describe almost the unforecastable. Just like we were here 5 to 7 years ago.

I—last time, I only ever testified once before. It was on the issue of natural gas, and I was actually trying to help the oil and gas industry get more drilling rights offshore and get more drilling rights to actually produce more.

So I understand what restricted supply does to markets, but I cannot forecast energy demand. No one can, because it's geopolitical.

So what we have to do is in the process look at responsible exports over time that allows the win. I talked about. Job creation in the oil and gas sector and the exploration side, job creation downstream, and not hurting the American consumer with the unintended consequence of bringing the oil price back to the domestic consumers' electricity bills.

I think there's lots of factors that can be put into place in there, and you've mentioned some of them. We can go into it, and we have views on it, but I think that's what we should study in fulsome detail.

In the meantime, let's allow exports to our FTA partners.

Senator STABENOW. Let me just ask in my final minute, because it seems to me Mr. Chairman our goal ought to be to export natural gas, but also export finished products.

Mr. Liveris you talked about the 8 times factor on a finished product. Could you tell us a little bit more about how the components of natural gas are used and how many different things around us have those components in it?

Mr. LIVERIS. So the ingredients of natural gas are what we call feedstocks, natural gas liquids. The bounty of shale gas is, thanks to our great oil and gas sisters and brothers, they—the bounty, the geology, is that the gas is very wet, so-called NGO rich.

A God-given gift.

This is very unusual. The gas fields around the world are not as rich as these gas fields.

Therefore there's a new unintended consequence, which is all the ingredients for everything from laptops to smart phones to pharmaceuticals to paints and varnishes to carpets to cosmetics, all the vital ingredients, 95 percent of them come from fossil fuels.

The best and lightest fossil fuel is natural gas for the reasons the Governor and others have talked about, and natural gas liquids should not be shipped overseas and be burnt in Japanese cooking ovens. It should be kept home so we can add value at 8 times by building these facilities.

There's $4 billion an ounce in Louisiana and Texas alone by Dow Chemical, $20 billion by Sasol, $15 billion by Shell to value-add.

This is a big bet that we're going to get responsible supply and responsible production.

It's a risk. It's a managed risk, as long as we don't interfere and create a new unfettered demand for it overseas and stop all this value-add in the country.

We should be thoughtful on how to have our cake and eat it too here by doing all these building blocks, all these jobs, small businesses.

For every supplier to Dow that is less than $50 million in size, I build a community. A hundred and fifty communities in Amer-

ica—small businesses benefit from this value-add. That's why there's a job multiplier of 5.

For every job I create, 5 jobs get created around me. This is why it's a manufacturing renaissance that I never thought I'd see in my career lifetime, right here in America.

Let's try and get it right.

Senator STABENOW. Thank you.

The CHAIRMAN. With the schedule of the witnesses and what we're dealing with in the Senate today, I'm going to call another audible.

Senator Barrasso is going to be back next. He will have questions and other colleagues are going to come back.

We are going to stay here and just keep going. So if you all will indulge us, you can be sure, Mr. Liveris, you are going to get your discussion of fulsome detail on this question.

We'll stand in recess until Senator Barrasso comes back.

[Recess.]

Senator BARRASSO. Thank you for reconvening.

We'll ask some questions and then we're going to try to get back and forth to vote so that all of you who have traveled great distances and have spent your time will still have an opportunity to share your wisdom and your thoughts with all of the members of the committee. This is one of the best attended of our committee meetings that I've ever seen.

So there's obviously a great deal of interest in this, even to the point that in Investors Business Daily this morning, front page, Natural Gas Exports Where The Jobs Are. We're focused on obviously jobs and the economy.

Tonight the President promises in his State of the Union, at least the White House Press has promised, that he will pivot to jobs and the economy. This is apparently his eighth pivot to jobs over the last 4 years.

So I'm—as someone from the State of Wyoming, a State with exceptional amounts of energy reserves, this is a big issue for us.

Mr. Eisenberg, I'd like to just ask you if I could, is in your testimony you state, quote, the United States ability to challenge other countries? existing export restraints will be virtually nonexistent if the United States begins imposing its own export restrictions. You go on to say U.S. actions are often replicated by other trading partners, to our own dismay, and if the United States went down the path of export restrictions, even more countries would quickly follow suit and could easily limit U.S. access to other key natural resources that are not readily available in the United States.

So, would you please expand on this, in your comments for the committee?

Mr. EISENBERG. Sure, and thank you for the question.

I should probably preface that by saying we have a team of international trade experts who would be very happy to support any questions for the record beyond what I can answer here today.

Senator BARRASSO. Great.

Mr. EISENBERG. But yes, I think if you look, certainly most recently, at the China raw materials case that the U.S. just won, and we're in a situation where if we actually turn around and make the

exact same argument, then we could basically be laying the foundation for further challenges by others to our commodities overseas.

So, yes, as I understand it there are significant WTO issues here.

Senator BARRASSO. Dr. Medlock, the—I'd like to ask you about LNG exports to national security, and your comments specifically made some focus points there.

Currently many of our closest allies in Europe are heavily dependent on Russian gas.

Russia has used its natural gas resources for political leverage against these countries.

Other allies are dependent on Iran's energy. Turkey, a NATO ally, receives 20 percent of its natural gas from Iran. In addition, Japan, one of our closest allies in Asia imports significant amounts of Iranian oil.

I've introduced bipartisan legislation which is not always that common here on Capital Hill-bipartisan legislation to expedite LNG exports to our NATO allies, to Japan and to others.

Would you explain how LNG exports would promote the national security interests of the United States and its allies?

Mr. MEDLOCK. As briefly as possible.

Yes, in fact one of the——

Senator BARRASSO. I thought we'd go until somebody else shows up——

Mr. MEDLOCK. Sounds good to me.

Senator BARRASSO. Go ahead. That sounds fine.

Mr. MEDLOCK. In a nutshell, and you've already seen a microcosm of markets changing within Europe alone since what's happened with shale in North America started to happen.

In particular, you had players that were invested all the way to the upstream end to bring natural gas in the form of LNG to the United States that were investing very heavily throughout the value chain to do that.

As soon as shale took off in North America, those supplies basically had to find a place to go, and the first point they were actually directed to was Europe.

What that did was it created pressure on the existing pricing paradigms, the existing contractual relationships between large buyers in Europe and Russians, and in particular, gas prime.

What that has basically led to is a destruction of the preexisting pricing paradigm, which was one of oil indexation.

Now what you've actually seen is gas prime relent to a lot of their major buyers in Europe and actually allow an element of spot indexation in their pricing structures, and what that tells you is that when you add liquidity to a market, you change a lot.

What that means is it begins to challenges the revenue—it begins to challenge the revenue streams the gas primes value so much and puts them in a very precarious position because no longer do they have a captive customer. Now they actually have to think actively about price and negotiate on pricing terms which basically changes their negotiating tactics, not only at the bargaining table for natural gas, but also around other geopolitical interests, visa vie Belarus, visa vie Georgia.

So we can think about lots of different things that this begins to impact because ultimately they don't want to lose the market. So that's but one example.

You can think about this spilling over into Asia, as well, where the oil index paradigm has continued to persist until recently when you actually see CO Gas actually signing up a long-term contract for a cost plus, a Hub plus index, for gas out of the Cheniere facility, it's a bean pass.

What do you think they're going to do with that contract at every subsequent pricing negotiation they have?

They're going to walk in, they're going to put it on the table and say look, I want a gas index deal because I've got one and I've got a line of suppliers willing to provide it to me.

It changes everything.

It's about liquidity, and that's something that has been lost in a lot of the comments I've heard today, as there's been no discussion of what liquidity actually means for the way commodities are priced.

Gas has been indexed to oil because it has not had liquidity. That's something that's changing in a dramatic way largely because of what's happened with shale in this country.

Senator BARRASSO. Thank you, appreciate it.

Mr. Gerard, I'd like to ask you about natural gas production on public lands, Federal public lands.

Many in Congress are looking for ways to create jobs while at the same time raise revenue for the Federal Government.

We can do this by increasing natural gas production on Federal public lands, in my opinion. Right now companies are unfortunately shutting in natural gas production on Federal public lands.

Workers are losing their jobs.

Federal revenue is being lost, so would you explain how LNG exports will help create jobs in this country and increase revenues to the Federal Government?

Mr. GERARD. I think there's 2 issues there Senator.

The first relates to the public land itself, Federal lands, and of course there's a question there of leases, permits, etcetera. Unfortunately today, production coming off Federal lands generally is going down. The number of permits, the number of leases are going down. You're seeing a great disparity being created between Federal land and private land.

I think the Congressional Research Service sent a report to somebody here in the Senate-recently reported that this vast Shale Gale we're talking about, particularly in unconventional resources, 96 percent of that increase in production in the United States is occurring on State and private land. So we've got to get the politics right and the permitting right, back to the Governor's earlier comments about the need to be more efficient and thoughtful and actually allow access to the Federal land.

Now a lot of the resource we're talking about today excludes the potential for resource on the Federal estate. For example, today 85 percent of the outer continental shelf has been placed off limits. We're not sure just how large that resource could be.

So when we have estimates talking specifically about natural gas estimates today showing at least 150–year supply, it could be mul-

tiples of that if we had true access to the Federal lands to develop it there.

Laws of supply and demand will show that if given the access to produce what we have on the Federal estate clearly could help meet any demand for LNG exports would once again find the market.

The issue today is not a supply question. We have abundant supply. It's a demand question. How do we make sure there are markets in place that we can fill?

LNG export is a perfect opportunity and that's why under the Natural Gas Act we would strongly encourage the Department of Energy to move quickly to approve those.

The market will sort out who eventually builds those facilities, but if we don't get there quick, for all the other economic reasons we talked about, that's going to be filled by somebody else, and we're going to miss the window.

Senator BARRASSO. Could you talk a little bit about how the BLM's pending hydraulic fracturing rule could hurt jobs and decrease Federal revenues?

Mr. GERARD. It goes back to the same issue of our ability to produce on the Federal land and back to what Governor Hickenlooper had said earlier.

Historically oil and natural gas have been regulated by the States. For the past many, many years there's been a good relationship between State and Federal Governments, in terms of permitting access to the land and eventually producing the energy on those lands.

When you add multiple layers, particularly Federal layers, that potentially conflict, confuse, and further delay, it further discourages the private investment on the Federal land.

So once again you create a great disparity in where the investment dollars move away from the Federal estate because they know there's a better market opportunity on private and State land.

The days to permit on private land—you're looking at places like North Dakota, today the second largest oil producer in the country.

It takes days or weeks to get a permit compared to months, and in some instances years, to get a permit on Federal land. It's a big difference and something that ought to be looked at by the committee.

Senator BARRASSO. Mr. Eisenberg, I want to get back to you. You talked about the National Association of Manufacturers and how they strongly oppose using NEPA to require cradle-to-grave lifecycle impact analysis that assesses the impact of exported cargo.

Explain the EPA's asked Federal agencies to conduct such an analysis for LNG export terminals and coal export facilities in the Pacific Northwest, You go on to state that such a move would create a very dangerous precedent that could be used to block exports of all types.

So the question is: would you please elaborate on the types of exports that could be negatively impacted by the EPA's proposal?

Mr. EISENBERG. I mean, we're—thank you very much for that question, Senator.

We are very worried that if we get a precedent that requires a lifecycle cradle-to-grave environmental impact analysis that the possibilities truly are endless for what you could block to export.

Looking at the coal export projects in the Pacific Northwest, what some have called for up there is to go all the way back, to take an exam-underneath the impacts of the mining, which are already permitted things, the transportation, the construction of the port, the shipping overseas, and then the ultimate burning of the commodity.

It would be a significant change in law and policy to look at the environmental impact of cargo, and this is something that can, I think, all manufacturers really have a concern about because where do you draw that line? Is it agriculture, I mean you could really bend this in a way——

Senator BARRASSO. Could it be automobiles?

Mr. EISENBERG. It could be automobiles. It could be planes

Senator BARRASSO. It could be airplanes, heavy equipment, tractors.

Mr. EISENBERG. Anything.

So manufacturers are very, very concerned about heading down that path for no matter what that commodity is.

Senator BARRASSO. Thank you very much.

Mr. Liveris you argue that we shouldn't export LNG so we can create jobs here in the United States, and you say that you just want to see natural gas exported in solid form products instead of liquid form. You say you want to give American companies the opportunity to add value to natural gas and earn a higher return for the resource.

Why shouldn't, you know, the Federal Government set up a policy to benefit manufacturers higher up on the value chain?

You know, why shouldn't you just limit exports of chemicals so that domestic manufacturers can add value to them before they're shipped overseas, and the question is where you draw that line, isn't it?

Mr. LIVERIS. Actually in my testimony Senator I didn't actually say that it's either or. In fact I went to great lengths to say it's and.

I think we should do both.

We should export LNG, and I think definitely we should look at the public interests with respect to our NATO allies.

That's something we should have on the table.

But in addition, let's put the power of the and in place.

Let's look at the unintended consequences of a non rules-based free trade market, gas. One day it may well have the liquidity to be a rules-based free trade market, but today it does not. OK?

The unintended consequence of trying to do one or the other is you transfer the risk away and you let the risk be assumed by American manufacturers and consumers to the positive of someone else being de-risked overseas.

Let's do both. Let's have exports and look at the intended—unintended consequences on domestic consumers.

Senator BARRASSO. Mr. Medlock, can I ask you to respond to what Mr. Liveris just said?

Mr. MEDLOCK. Sure.

Liquidity is something that is gained as markets mature, as you have more entrance of suppliers and demanders and that's precisely what we're seeing in natural gas markets around the world right now.

If you do anything to impede that progress than you slow that progress of liquidity, you actually end up creating rents along pieces of the value chain.

In this particular case, let's say hypothetically there was a cap placed on the amount of LNG that could be exported that was a nonmarket cap. Basically what you do is you provide rents to those first movers, the ones who actually build the export infrastructure because the prices will never adjust abroad to actually bring them down so that you actually end up with super profits basically for companies involved in the export business.

So, I would not promote that because by actually limiting how liquidity grows you actually support certain elements of the value chain which is not competitive, to be quite frank.

Senator BARRASSO. Thank you.

Senator Coons.

Senator COONS. Thank you very much Senator Barrasso, and thank you to the panel for a chance to be with you.

I'm excited that this first energy committee hearing is focusing on such a basic question about how we embrace the broad energy future in front of us.

Let me start if I might with Mr. Eisenberg and Mr. Liveris, from NAM and from Dow.

Just regarding the potential approaches for how to balance the factors that you've spoken to: the competing environmental, economic, and national security interests. You note that policymakers should aspirationally rely on the best quality information, on objective material, and on metrics that allow making the best decision in a public policy process. This is because of the inherently limited nature of projections and modeling, particularly for world market conditions, especially in energy.

What type of systems do you suggest might be put in place to evaluate ongoing and potential impacts intended—not intended, even while the DOE and FERC licensing processes are underway. In your view, if we phase in licensing for export of natural gas, what would be the most prudent timing in which you would phase that at?

Mr. EISENBERG. Thank you.

I do think, and as you know in our testimony we do call for the best quality information in this process, and I think it's important, and this is a question that Senator Wyden raised in his comments on the DOE study, which are that they used the 2011 Annual Energy Outlook Statistics, and we absolutely agreed that that should be updated.

But at the same time that can be updated while the permitting process is ongoing. Right now we are building none. We are permitting none. We have a complete moratorium. So let's get on with it and continue to have the best quality information for the fact-specific determinations that DOE must make as they go through this licensing process.

You know, there is, as Mr. Liveris said, there are 2 studies that DOE has done on this matter. There—I read them over the weekend. There are no shortages of studies out there that Delloyd and IHS and others are doing on this issue, and I appreciate and am happy with the continuing dedication to understanding the impact of this.

But that's not a reason not to let the free market work. We—our policy says that we fundamentally believe in free trade and open markets, and we do. We view it with respect to this and just about any other commodity.

So we think we can have it all here, and we do think that we should strive to have the best quality information.

But it shouldn't be a reason to continue with the moratorium.

Senator COONS. Thank you.

Mr. LIVERIS. Senator Coons, I'm all for studies and consultants. I'm all for academia, but they don't buy gas.

I buy, as Dow, more gas than most countries. OK? So we are a significant purchaser of this risk and, therefore, when you fool with this risk by not having the public interest in mind in its totality, you have to get your criteria right by looking at all the angles.

All the angles did not get looked at 10 years ago when we deregulated power in the19 90s in the Clinton era. It had an unintended consequences to the domestic sector.

We had gas prices spiking as high as $15 and $18 and $20 per million BTU.

Manufacturing was fleeing the country. Factories were being announced across the world. It wasn't labor offshoring. It was energy offshoring.

Energy is the lifeblood of an economy in all of its forms.

In its value-added form, the one that Senator Stabenow asked me about, the consumer, the home heating bill of the consumer, in all of its forms.

So be careful of one or 2 or 3 studies giving you the absolute criteria. As you said in your comments and Chairman Wyman made comment, as well, no one gets this right.

We're in the 4th or 5th year of trying to understand what this bounty is. Can we produce it responsibly across the country? There are regions that differ already. We know that. The geology is different. We don't know how much supply we have.

Let's be careful testing our country on when a market gets to maturity on liquidity risk. Why should we take the liquidity risk as a country in a totality while someone overseas benefits from our bounty.

Be measured in the criteria, let's crawl-walk-run through these applications.

Exports should be allowed. They should be allowed through our FTA partners, that's the public interest.

Develop the criteria as we go along.

Figure out what the unintended consequences are.

I want to clarify I said over and over, there is no such thing as free trade. It's rules-base free trade.

There is no GATT, there is no Doha. Why? Countries don't agree on the rules.

What rules are we agreeing to here when we decide to approve 12 applications overnight?

Be careful that we look at this treasure and set the rules with America in mind. That's all.

Senator COONS. Thank you Mr. Liveris.

I'm very sympathetic to the strong perspective you've presented that urges us to focus on job opportunities and on the difference in portability between natural gas and petroleum.

Natural gas is distributed throughout the United States largely by a robust, nationwide network of more than 300,000 miles of pipelines, and we have a remarkable transmission capacity in the United States. If I understand right, we've had a more than 50 percent increase in pipeline capacity since 1995, and I just wondered, Mr. Gerard, if you had any comment about the policies that have been adopted that have helped facilitate that creation of that significant robust nationwide transmission infrastructure?

Mr. GERARD. It's a great question Senator. One that we, I believe, need to turn our thoughts to more often. For example, the infrastructure issue in the United States will help facilitate to continue to drive prices down for commodities, particularly for oil and natural gas.

Yet today we find ourselves hamstrung in some circumstances, I think as Mr. Eisenberg spoke of earlier in permitting processes. But that infrastructure that exists today needs to be expanded to truly seize the opportunity we have before us to become an energy super power.

Where Andrew and I might take a strong difference is there are other aspects of this view that we need to think of, as well. That's the job creation opportunity in the oil and gas sector itself and the opportunity to have it all.

But the government can't better—can't understand that risk any better than the private sector can. So the worst thing for us to do is to get the Government in the process to try to determine through an export mechanism what that price should be.

If the market signal to my people is that there's going to be a limitation on where that demand might go, they then pull back on their rig counts, on the production itself. So you have a reverse adverse multiplier effect throughout the economy because you're limiting potential demand where that market can go.

As I mentioned earlier, we shouldn't underestimate supply is not the issue. We have a vast supply, and it's by and large due to our modern techniques and technologies.

It's really a question of demand and if we get the government involved in limiting demand through slow walk processes, review after review after review, we're then at a disadvantage in the global market because there are others pursuing that market very aggressively and providing liquidity to the natural gas market.

Senator COONS. One of the mechanisms, if I might Mr. Gerard, that I understand has made possible the financing and construction of a world class transmission and terminal system in this country is a tax structure called Master Limited Partnerships.

In your view have master limited partnerships been essential to deploying and developing the natural gas infrastructure of the country?

Mr. GERARD. Yes, they've been very important to us. In fact I know there's talk now of potentially looking at the renewable space in the energy development, something we and the oil and gas industry strongly support and spend billions of dollars to try to figure out those new technologies.

But yes, they are important because they allow us to bring in investors and others, not to put their resource at risk, so that we can bring these commodities to the marketplace.

Senator COONS. Does that strike you as a structure that might be able to support both natural gas, oil development as it has in the past, and renewables? It would literally be an all-of-the-above financing strategy.

Mr. GERARD. I know folks are looking at it and I understand you are as well Senator.

We'd be happy to get some people much smarter than I am to take a close look at that and come back to you with some details on how that might be viewed in the marketplace.

Senator COONS. Thank you. I'd be grateful.

Mr. GERARD. Thank you.

Senator COONS. Before I yield the gavel to Senator Alexander, I'd just if I might—a question to Dr. Medlock and Ms. Beinecke. I also chair the Africa Subcommittee on Foreign Relations, and I'm interested in what you think of the potential impact of natural gas development on Africa. They're fully exploiting both the dramatic new offshore gas discoveries and the potential for shale gas, which exists in many places across the continent.

What positive or negative consequences might there be for U.S. businesses and technology export and how might this affect development trajectory of the continent?

Ms. BEINECKE. I'm going to defer to Dr. Medlock on that because I don't—haven't looked at the issues in Africa, and so I don't, we don't have an opinion on that.

Mr. MEDLOCK. So, at a very high level, certainly the discoveries off the east coast of Africa: Tanzania, Mozambique, those portend to really convey a tremendous economic benefit to a region of the world that needs it.

There are large shale gas resources that have been identified in Algeria, already a large gas producer and supplier to Europe, but also in South Africa, an area that hasn't really seen a lot of natural gas development in the past.

So the potential for, you know, the conveyance of benefit is definitely there.

I think the thing that you really have to think about that differentiates Africa from the United States is the regulatory overlay. In particular, when you think about the mechanisms in place in the United States to really insure the safety of the general public, the safety of the environment, the safety of the workers involved in these activities, those mechanisms don't exist, more or less, anywhere else in the world the way they do here.

So I think, you know, a real understanding of how to carry what we've learned in this country, being such a large oil and gas producer for so many years abroad we really will sort of help to allow the development in a responsible way of those resources.

Senator MURKOWSKI [presiding]. Senator Coons, we're over time. I'm sorry.

Senator Alexander.

Senator ALEXANDER. Thanks Madame Chairman. Thanks to the witnesses. I see the chairman and the ranking member here. I want to thank them both not just for the subject of the hearing, but for the even-handed way in which they've pursued this, and I really appreciate that. I'm looking forward to working with them on this committee.

Just an observation and then a question. The observation is maybe one thing we can agree on here is that energy research is a good thing. I mean it's hard to think of—well this is an overstatement, it's hard to think of an important technological advantage over the last couple of years that hasn't had some government research and as the earlier discussion went back and forth with unconventional gas clearly the Department of Energy Demonstration Project, maybe even the Tax Credit, the Sandia laboratories work on mapping all of that was essential, but I keep thinking that-that maybe we actually have an energy policy in the United States and don't know it and it boils down to government sponsored research, private ownership of property, entrepreneurial attitude, big market and free market and that all of those things have suddenly given us what amounts to a terrific advantage in energy.

I was in Germany recently, and they've got a big complicated CAP and trade. They're closing their nuclear plants. They're buying nuclear power from France. They're subsidizing Chinese solar panels and they're buying coal from the United States so we-we've ended up with a pretty sensible policy and the one thing it would seem to me that it would encourage that would be doubling the amount of Federal dollars we spend on research for such things as what do we do with CO_2 from coal plants, how do we get a better battery that's been mentioned by several people in terms of storage, etcetera.

Now here's my question: Do we really have a problem here? I have 3 images in my mind.

One is this weekend I went quail hunting in south Texas and we didn't find any quail because of the drought. But what we found—I hadn't been there in 3 years in that section. We were in the midst of the Eagle Ford shale and there were 5 motels where there was one, there were oil rigs everywhere, there were new networks of roads, there were big lakes, big trucks going back and forth. I mean it's an astonishing thing, gas flares everywhere so it's easy to see the great production value and the dollars that come in North Dakota and south Texas in our economy from this production. Now that's one image.

The second image is Australia last year where they're selling their gas to Asia at 5 times our price. Not only are they selling it to Asia at 5 times their, our price, they're paying 5 times our price for their own gas because they're paying the world price for natural gas. I think back to Tennessee about the number of workers at Eastman Chemical, about the farmers we have, about the auto jobs we have, about the truckers we have, and I see the enormous, incredible advantage the United States has at the moment from having a domestic price of natural gas. It's really a Godsend, and it's

very unusual, and I think our policy got us there, but I think we should examine it very, very carefully which is what we're doing today. I suspect it's a much bigger source of jobs than the production value of oil and gas is in the United States. The production value of all the farmers, all the chemical companies, all the manufacturers in our State is a huge advantage.

Then the third image I have is the United States going into Iraq because of oil and because Iraq had gone into Kuwait and there we are. So while I'm a big free market, free enterprise person, I also see the value of the domestic price. I don't want to lose that. I also see the national security consequences of this.

So my question is, though, do we really have a problem?

One witness said that we might not export more than 5 or 6 bcf. That's about 10 percent of what we produce today, if I'm correct. Is that about right? At what point at what percentage of exports, and let me just go down the line and ask this question. If we don't have time today to do it, maybe you could write me out—the question has an A and B part. A—at what point—at what percentage of exports begins—do we begin to lose the domestic price advantage of natural gas that we have today and No. 2, under present policies if you had to make a guess, what would be the range of the percent of our natural gas production that we'd be exporting in 10 years?

Mr. LIVERIS. I can't help but pass up the comment on my home country of Australia who's desperately got it wrong. OK?

It's one of the only gas rich countries of the world that, in fact, has the phenomena you just talked about. So, one sector exports from the Northwest shelf of Australia, the oil price bleeds back into the Southeast corner of Australia, manufacturing is collapsed, and 2 of the 5 most expensive cities in the world are Sydney and Melbourne. The retail prices are through the roof.

So if you want a poster child for getting it wrong, and this may cause me never to get back to my home country but I'm going to say it, my home country is the poster child.

So, the questions. Is there a number? It's unknowable and unforecastable which is why I believe the process has to work with the public interests as its lens. Every single one of these applications as you build up these terminals from one to 2 to 3, from 2 billion mcf to 3 to 4 to 5, the market will send a signal. I'm a free marketer, but the market sends signals like it did in 01–02 when the market read there wasn't enough gas to meet current demand, the price went through the roof.

Eastman and other companies like Eastman suffered the consequences.

So we've got to be careful. The market will work.

But don't just flood the market with one answer. It's not an either or. Don't do 12 bcf. Don't do 20 bcf.

Senator, I can't give you the exact number. I'm not that smart. All I can tell you is this is not an open market. As I said, LNG, you have to work hard to make LNG work.

So I would think that as these terminals get built, we'll get the better of job creation upstream and job creation downstream. I already indicated that's a 5 times multiple.

We can get the farmers to win, we can get the Eastmans to win, we can get the consumer to win, and we can have exports.

The CHAIRMAN [presiding]. Thank you Senator Alexander.

Senator Heinrich.

Senator HEINRICH. Thank you Mr. Chair——

Senator ALEXANDER. Mr. Chairman can I ask that the witnesses answer that question in writing after the hearing?

The CHAIRMAN. Yes, that would be great.

Senator ALEXANDER. Thank you.

The CHAIRMAN. Senator Heinrich.

Senator HEINRICH. I want to thank Senator Alexander for his comments about basic research and development. Obviously Sandia National labs played a real role in the fracking phenomena, but also in a whole range of energy development and research over the years and that ought to be something I think we can agree on that that is a good thing.

I want to ask our witnesses today about something that hasn't received a whole lot of attention yet but Mr. Liveris touched on it during Senator Stabenow's comments, and I want to drill down a little further and get people's thoughts on this and maybe Mr. Liveris, Mr. Medlock, and anyone else who wants to comment, it's the issue of wet versus dry gas and we're talking about natural gas here today, but that means many different things and certainly what gas provides these feedstocks that have been discussed as a lever, a job, as a lever to create more jobs than just the energy production.

Then we also have in New Mexico we have basins that some are wet and some are dry. So what I wanted to ask is do our policies and does the market, and I'm not going to describe this particular market as a free market because I don't think it is yet, but do our policies both at the Federal level and then do the economics recognize the distinctions between these different products between natural gas liquids, natural gas and the fact that it may have very different ramifications to export dry gas to be used as an energy support versus exporting gas that is rich with these natural gas liquids that are so important for the manufacturing sector, and how do we make sure that as we move forward that both our policies and economics align with those job creation goals. Mr. Liveris and then——

Mr. LIVERIS. Yes, I think it's a very, very educated question Senator, so thank you for asking it.

It allows me to make a new point and that is exactly your point.

Wet gas, the LPGs, propane and butane, do have a market. The market tends to work. It's the fuel equivalent of cooking oil and home heating oil so if you extract propane and butane, yes it can go to petrochemicals and other uses but it has a heating market. That market is out there and it's working. No one is suggesting anything different.

The real toggle in this conversation is that other ingredient that only chemical engineers like me talk about and that's called ethylene. Ethylene is unfortunately—can stay in the gas. It doesn't get rejected.

It can go to Japanese power stations and when they set the BTU speck they like to keep it in because it gives them more BTUs. They like to pay the domestic, they like to pay a gas price for a rich ingredient.

Some of these countries actually extract it and add value to their own countries. So I think every country in the world who extracts ethylene goes to the trouble of answering your question in a very educated way. They put aside the ethylene for their domestic economy.

Now that sounds like interrupting free markets doesn't it? But ethylene doesn't trade. There is no real world ethylene price. I can get ethylene in Saudi Arabia at a very different price than I can get it in the United States.

That's where I think we have to be very measured on what we export, but that opens up a whole new line of questioning, and I'm happy to answer it at some future time.

Senator HEINRICH. Mr. Medlock.

Mr. MEDLOCK. Just real briefly with all of the longer chain hydrocarbons which you're talking about here gas processors when they actually see the gas at gathering systems come to them will make a decision about the value of extraction versus the value of leaving a certain component of those longer chain hydrocarbons in the stream.

In a situation where the ethylene price and the propane price and the butane prices are actually elevated sufficiently enough, then you'll see them extracted. You'll see leaner gas.

It has to be within a particular range if it's going to be pipeline inspected in the U.S., but there is a market mechanism that actually drives how high that gas is in effect.

Senator HEINRICH. Is that highly dependent on that sort of the state of infrastructure and the local conditions because many of these things are being produced in places that don't have the long history of infrastructure that say the basins in the Southwest like New Mexico and Colorado have? I mean——

Mr. MEDLOCK. Oh certainly it does, certainly it does. You're talking about gas coming on line say in south Texas. This is an interesting example actually, what's happened in the Eagle Ford and what it's done to actual NGL prices at Mont Belview.

You've seen a massive disconnect between where Mont Belview NGL prices have been in the past couple of years relative to where they were in, previously in relation to crude oil prices and it's because you've got a lot of NGLs coming into the market that are being extracted because there's high value associated with them.

But what that's done is it's led to a glut in that particular market and so it argues for infrastructure.

Mr. GERARD. Senator I'd just like to say quickly, yes, it does have a market because if you watch our rig count, you'll see it move from what we call the dry gas to the wet gas. I would also add one of the great benefits, particularly the manufacturing sector today, more specifically even to chemicals, is that we are now at record highs, unprecedented highs for natural gas liquids production in the United States.

It's a very significant development by and large as part of associated development with natural gas.

Senator HEINRICH. Mr. Chairman, I yield back.

The CHAIRMAN. I thank my colleague.

We appear to have another vote, so I think we'll go with Senator Manchin at this time and obviously Senator Cantwell's great expertise in this area, so we want to get her in too.

Senator Manchin.

Senator MANCHIN. Thank you so much Mr. Chairman and Ranking Member Murkowski.

Let me just say first of all as one of the greatest concerns I think all of you, and I think I know that Mr. Liveris that you said I'm more concerned about how we start getting priced, who controls the American pricing, and once you go into that overseas market you lose your ability to set your own destiny. Is that correct? Is that probably one of the—I mean people are coming to me and saying you know you keep telling us how much oil you're developing now in America but our gas prices haven't gone down. How come?

Mr. LIVERIS. Yes, the ultimate point here is that energy, its fungible price around the world basis is oil.

Make no mistake. Everything else is domestic, nuclear, even coal tracks oil.

Senator MANCHIN. Has OPEC always controlled the pricing of oil?

I mean we developed our Nation on oil we found. We have a State that was rich in oil back at the turn of the 19th century/20th century.

Mr. LIVERIS. State-owned enterprises own 75 percent of the world's oil reserves and 50 percent of the production.

So State-owned enterprises (OPEC) from the early 1970s to this very day sets the world price based on supply.

They regulate supply. You know this, right?

Senator MANCHIN. I don't think anybody in the gas industry want that to happen to gas prices, would you?

Mr. GERARD. Senator, let me respond to that if I can first as it's been predicted due to this great technology we've been talking about, this game-changing opportunity.

Experts now predict if we continue down this road that the free market has brought us, the United States will surpass Saudi Arabia as the No. 1 oil producer in the world in 7 short years by 2020. We can ultimately have an impact and it all comes back to the free market.

That's why we've got to be very sensitive and mindful of attempting to intervene or to manage price or spots in the marketplace.

Senator MANCHIN. When you, and I'm so sorry we've been running back and forth in committees but I've been keeping up with what was going on here, you all do agree that basically this is our last great chance to have this type of a find in energy that could be game-changing for our country. A renaissance in manufacturing, transportation fuel, and what I think the question was asked by the Chairman, where's the sweet spot?

What I think we're saying is how can we work with you on exporting certain amounts, give us a timeframe to build up the demand in this market here in the United States?

Can you all live with something like that?

Mr. GERARD. Senator, most of us believe we're just at the front end of this Gale, if you will, both on shale gas and oil, that we haven't yet fully appreciate, just recently there was an announce-

ment in California at Monterey which some estimate to be an oil reserve 4 times larger than what we found in North Dakota.

Senator MANCHIN. But that didn't do us any good at all because the price is still $4 a gallon. At $3.50 to $4 a gallon so you can find, until the cows come home.

Mr. GERARD. It all comes back to supply and demand. It comes back to what we produce and how we put that into that global marketplace. Trust me——

Senator MANCHIN. To be on a level with a consumer in America today hearing reports that we have more energy now and we're about to be a net exporter, and yet they haven't seen any of their costs come down?

Mr. GERARD. No, let's use natural gas as a price as a great—as an example. That's a great question.

Today as a result of the natural gas price coming from about $14 to $3, the average family in America that consumes natural gas costs have gone down $1,000 a year. That's estimated to increase to a couple thousand dollars year as we become even more energy efficient.

Senator MANCHIN. OK.

Mr. GERARD. So there is a very significant consumer-positive consumer impact, not to mention the environmental benefits, etcetera, as the Chairman's——

Senator MANCHIN. I think finally the question I want to try to get to—I'm looking for the—I guess as the Chairman keeps saying the sweet spot. There's got to be an area where we can say OK we can with the prudent measures we have with the anticipated reserves we have export this much. We can dedicate this much time to develop the markets in America. We can transform our transportational fuels.

I've always said that I thought every State when I was a Governor if someone said listen, we'll help you transfer all of your commercial fleet which would be our school buses, our mass transportation, our State road vehicles into gas-propelled vehicles working out of bulk stations. It would be the most cost-effective thing we could do. We could develop that within a 5-year period. We could have a renaissance in manufacturing. We have the crackers as we're talking about. If that's a possibility we need some time to develop that. That's what I would be asking for.

What is the time period? If we don't hit that mark, and let's say it's 10 years, then we should open up the market completely. If we can't get our act together, go for it gentlemen—and ladies, I'm sorry. Let's just do this.

Mr. GERARD. Senator, Senator, I guess the thing that concerns me in your comment is how you manage that, that development.

Where we are today, the opportunity's been created that no one would have predicted 5 or 6 years ago because the market found that equilibrium. It found the opportunity to put the downward pressure on the price.

The same is true of the discussion that we're having. The market will find that. Let's let the market fine-tune that recognizing we have a vast supply in the United States which is what's driving that price today in this country.

The CHAIRMAN. My colleague and I are going to miss the vote. We're going to let you all have about a 10 minute recess and then we're going to come back.

Senator Manchin's asking important questions we need to continue to dig into.

Thank you all.

[Recess.]

The CHAIRMAN [Presiding]. The committee will come to order.

Senator Manchin was practically in mid-sentence so he is going to raise his additional question and then Senator Cantwell.

Senator MANCHIN. I think where I am—if I can get an answer. Has anyone come to an agreement identified on a reserve, an amount of reserves that we have, proven reserves that we have and how many years based on demand right now? Because I read yesterday that no one can agree on anything—brightest people in the country.

Mr. GERARD. It continues to change Senator. In fact——

Senator MANCHIN. OK.

Mr. GERARD. Six/seven years ago someone estimated that it was about 20 to 30 years. Most recently the EIA has estimated that it's at least 90–95 years. Other independent analysis—ICF, etcetera have estimated it's 150 years, and there's some who've believe it's 200–300 years worth of supply at current levels of consumption. So that's——

Senator MANCHIN. That's a good thing.

Mr. GERARD. It's evolving quickly because of breakthrough technology as we define more resource. It's going up dramatically quickly.

Senator MANCHIN. Here it is. I am—I come from the private sector. I'm a free trader, and I'm concerned. I'm concerned that we're going to lose this opportunity of a lifetime, generational if more, if not more.

But there has to be a balance too. That's what we keep looking for, that balance. So if we're saying we had a 10-year window and we come to an agreement with the industry that as government, we come to an agreement for a 10-year window that will have X amount of exporting while we develop the demand in this country basically on transportational, manufacturing and other things that we can develop that was left us that will come back, I think Mr. Liveris' company has been all over the world and they're coming back because of this energy, and making sure that we never get caught in a world pricing such as an OPEC. Those are the concerns I would have as a citizen of this great country and definitely as a U.S. Senator from my constituents.

I think that's what we're asking, and I'll use this as a hypothetically. Let's say we agree to 5 bcf a day, just for the sake of throwing a figure out. How—what are we exporting now?

Mr. GERARD. Virtually none. Small——

Senator MANCHIN. OK. So 5 billion, 5 billion, 5 bcf a day is pretty substantial, correct?

Mr. GERARD. Less than 10 percent of what we currently produce and consume.

Senator MANCHIN. OK. So 10—so if you're going to err on the side of caution while we're building up our consumption in this

country, I'm not saying that's a hard rock figure, but let's just say for, and we have a 10-year window, f we can't get our act together and have an energy policy that works for this country, then all bets should be off, and you should be able to do whatever you have to do.

That's what I think we're kind of talking about and asking if that's a possible—and I understand sitting, if I was sitting where you, I would be cautious about that.

Mr. GERARD. I don't want to comment on your ability to get an energy policy in the next 10 years but——

Senator MANCHIN. No, no we've got to move quicker than that.

Mr. GERARD. But let me respond this way Senator. I think the key is to look at the market fundamentals.

Senator MANCHIN. Yes.

Mr. GERARD. What happened today, and I can't overstate this, what is happening today is unprecedented in the history of our country in terms of our opportunity to become energy secure and self sufficient. Just think back 5 or 6 years ago nobody was having this conversation. Today we're the world's No. 1 gas producer.

It's now estimated through this advancement in technology, we'll be the world's No. 1 oil producer by 2020, 7 short years. That's how significant this is.

That's why we're very reluctant to go down a road where we say, well, let's take this great opportunity that indicates where you've got vast supplies, and now let's bring the Government in and see where we can manage the development of the market.

Senator MANCHIN. Do you think it's a fair evaluation when you look at all of the human sacrifices this country has made because of our lack of independence on energy?

It's a tremendous price we've paid in human life and value, if you would.

Mr. GERARD. I think the point, Senator, is if we've, again, going back to the supply, we've got ample supply, we've got vast supplies as far as the eye can see.

What we're seeing domestically, and those job numbers we're talking about are so realistic. Production in Pennsylvania. Who would've thought? Pennsylvania is a huge natural gas State today. Your good State today, as you know, is on the verge of a major breakthrough to become a big producer. Pennsylvania production has gone up 526 percent.

Senator MANCHIN. We're trying to create the jobs in West Virginia to use the product you're unleashing.

Mr. GERARD. I understand, I understand. I'm just using that as an example because of what's happening all across the country where we least expect it, Ohio, etcetera, etcetera. We're creating hundreds of thousands of new jobs, and we don't need to view it as we used to view it in terms of scarcity. We don't have a scarce resource anymore. It's abundant. It's rich.

Senator MANCHIN. I've heard that before. I've got to be honest with you.

Mr. GERARD. I understand.

Senator MANCHIN. I've heard it all before. OK.

Mr. GERARD. I understand. I understand.

Senator MANCHIN. The bottom line is we have a real golden opportunity to be able to use the product in America, in West Virginia, and other States around that had this find and develop a whole new renaissance of jobs, quality jobs. So you can imagine if we're being a little bit——

Mr. GERARD. I understand.

Senator MANCHIN [continuing]. Cautious about this. We want to work with you, Sir. I can assure you.

Thank you.

Mr. GERARD. Thank you.

The CHAIRMAN. Thank you Senator Manchin.

Senator Cantwell.

Senator CANTWELL. Thank you Mr. Chairman. I have been back and forth between votes because first of all I wanted to make sure that I was here to congratulate you on your new leadership position as the chair of this committee, and I certainly look forward to working with you and Senator Murkowski because I know you're both very serious about moving legislation. I also think this hearing is an example of the type of process by which you intend to air these issues and to move forward. So I thank you for that, and it's definitely worth coming back 2 or 3 times.

My question—I know I had some questions for Mr. Medlock, but I understand how people's schedules don't always conform to the Senate schedule.

But Ms. Beinecke you know the NRDC released a study recently that found out that by 2025 taxpayers will be forced to spend more than $270 billion a year for disaster relief if we don't tackle climate change. While we're having this conversation about natural gas, I don't know if you can make a further comment on. Don't we, if we're going to see cost in the future, have to do something better, putting a true market price on carbon.

Ms. BEINECKE. Senator Cantwell. First thank you for the question.

Clearly we're seeing climate impacts now. Our study was projecting to the future but here in this country just this year the consequences of Hurricane Sandy which the Senate just passed what was it, $60 billion of disaster relief for the New York Metropolitan area. It's a huge expense. The drought that's been going on in the Midwest all year, another huge expense, almost stopped shipping in the Mississippi River just a few short weeks ago. The consequences of wildfires in the West; we are having extreme weather events all across the country. I was talking to Mr. Liveris earlier today about what's been happening in Australia, his home country, where the extreme weather events have been even more serious.

So climate change is here. We need to take it seriously.

We have to get to a clean energy future that invests in renewables and efficiency. Even as we use natural gas, it's not the solution over the long term because it is a fossil fuel.

We have to develop it as responsibly as possible. There are people who are so alarmed with what's happening unknowingly to their health because of the lack of disclosure and the lack of safeguards. So we have to deal with the consequences now but we—and this of course if the committee's charge to deal with the long-term future of the country and look at what the investments we

need to make in a cleaner energy future that absolutely minimize the impacts of climate change, some of which we will experience.

Our aim is to insure that this Nation experiences as few as possible and that the planet does, as well. The U.S. is a major contributor so we have a major leadership role to play.

Senator CANTWELL. Thank you for that. I mean we're talking about this now about what to do price-wise with export and import, but to me it seems like a microcosm of a larger issue, which is how to put the right signal on in general. Mr. Gerard I just want to ask you, you know there's a lot of discussion about the price today, but do you think that people developed natural gas for the export market? Did they have that in mind or were they developing it for the domestic market?

Mr. GERARD. Have export in mind when they developed it did you say?

Senator CANTWELL. Yes. Do you think the decision to invest in natural gas in 2010 was driven by the look for large export terminals or do you think they were looking at the domestic market?

Mr. GERARD. I think the thinking has evolved on that, and my sense is that over the past few years, yes, they look more and more to look to other markets because our supply is so vast here today to meet demand. Otherwise what will happen obviously is we'll begin to cut back on the amount of jobs we create as part of that energy production. So while 3 or 4 years ago when this, we were all talking about LNG imports at the time, clearly they weren't thinking about exports in that context. But over the past few years, as you see the evolution, the change in opportunity, today they clearly focus on that as being a potential market opportunity that we should take advantage of because it assists us here at home in creating the energy, producing the energy, and all the other benefits we've talked about to consumers and others.

Senator CANTWELL. Oh, I'm just trying to sort through some of this because some people are saying, well a lot of people are, I think—I don't know if it was Mr. Tillerson or somebody said, "well, we're not making any money and this is why."

So my question was whether you were looking just domestically when you had the idea to expand or did you truly have in mind these international markets.

Mr. GERARD. It goes back to the market itself and looked at in a global context. Before when we were relying on other imports for natural gas there wasn't focus on the potential export market. Today the world has literally changed as we've talked about.

No one would've predicted this a few years ago.

But today we're looking for all the markets, all the potential for the United States to really establish itself as the energy super power.

You know it's significant that we've got an opportunity now to become energy secure as a Nation, but much of that with the job creation potential, the economic recovery will come because we allow the market to work and we allow that demand to be created elsewhere that we can meet with this vast supply.

That's how we will influence on a more global context the geopolitics.

Senator CANTWELL. I'm probably in more agreement with you than you think on allowing the market to work, but I just think the market has to have a true price on carbon as well because it's affecting us. So, I'm more than happy to look at this from a global perspective, andI definitely think it's interesting to see some of the applications like in my home State.

The shipping industry is going to go to natural gas which is welcome but to me it's going to be a question of what are those domestic applications—again this is why I wanted to direct them to Mr. Medlock and I don't know whether Mr. Eisenberg has something to say on that. What are those transportation applications that could take us further down the road of diversification in the United States, like the shipping industry or truck transportation or other things?

Again, I thank the Chair for the hearing and I look forward to how you're going to untangle all of this.

The CHAIRMAN. Thank you Senator Cantwell, and to untangle it we're going to need your expertise on global markets and global economics.

For those of you that don't know, in another part of our Senate life we serve on the Finance Committee and arguably are 2 of the most ardent pro-trade members of the committee because, in our part of the world, one out of 6 jobs depends on international trade. What we try to generally do in the Pacific Northwest is to grow things there, make things there, add value to them there, and then ship them somewhere.

So the challenge is how to take that strongly expansionist view with respect to trade and apply it in this area. It's easier said than done, but it definitely gets easier if Senator Cantwell is in the room because she understands global markets and actually was in the private sector dealing with them.

So I thank my colleague.

We're joined by the Senator from North Dakota who has already been gracious enough to spend a lot of time educating me on natural gas issues because he lives it every single day in his part of the world, and we really appreciate his expertise. Please proceed with your questions.

Senator HOEVEN. Thank you Mr. Chairman and I look forward to having you in North Dakota to see what we're doing there.

I'm disappointed that Governor Hickenlooper had to go. I wanted to commend him on building an energy policy for the State of Colorado that he said is really about developing all-of-the-above. I commend him for doing that.

So the question I wanted to put before him, but I'll start by putting before Ms. Beinecke is: What about a States-first approach just like that? In other words to have transparency at the Federal level and to have certain standards that may be set at the Federal level, but then beyond that having a States-first approach to regulation on these issues of energy development.

From what I heard from Governor Hickenlooper that's exactly what he was talking about so would you support a State-led approach to regulation and give States like Colorado and others the flexibility to truly develop their energy resources?

Ms. BEINECKE. Senator I think that first of all we do have a States-first approach because right now the legislation is at the State level. What I'm saying is that it's a patchwork quilt really across the 30 States where fracking is going forward.

Some States have disclosure. What kind of disclosure requirements they have vary considerably.

There are other different rules on setbacks, on well casings.

In each State it's quite different.

What we're asking for is that the committee look at what kind of Federal standards-minimum should be applied across the country.

If the States, and I thought Governor Hickenlooper was very eloquent on this point, that the States are working on this every day. They're trying to figure out what the best standards are. There may be a standard that the States, that a number of States have developed which, in effect, becomes a Federal standard which would apply then to all States.

I think the challenge now is the differentiation and the diversity in the 30 States in which fracking is going on and for potentially additional States in the future.

So what we're looking at from the environmental point of view is how do you insure the public that this activity is going on as safely as possible, that they have transparency, they have access to information, there's ongoing disclosure and monitoring and that the health impacts where there is growing alarm across the country of what they're being exposed to from water and air pollution, that they have the information on what those chemical and what those emissions are and that the data's available and that they are confident that the standards that are being set will protect them.

Senator HOEVEN. Would you say hydraulic fracturing is the same everywhere in the United States?

Are they pursuing the same energy product?

Are they pursuing the same geological zones so Federal standards——

Ms. BEINECKE. The geology differs across the country but the technology——

Senator HOEVEN. Excuse me. Let me ask my question, please.

Ms. BEINECKE. I'm sorry.

Senator HOEVEN. You're talking about a Federal standard and having it the same across the United States.

But isn't it true that hydraulic fracturing and what they're doing in different places is different?

Ms. BEINECKE. Senator I think that in many of our environmental safeguards there's recognition that there are conditions that differ in different parts of the country.

I mean our State implementation plans are on air quality are differentiated State by State but they're based on Federal standards and most of our environmental laws actually do recognize that the conditions in States vary considerably. But it does set a minimum standard that the public can be confident is designed to protect them and that is a combination of learning from the experience of what's going on in the States, but then looking at what the Federal responsibility is and applying that in a way that allows differentiation, but meets a certain standard so the public is protected,——

Senator HOEVEN. Are——

Ms. BEINECKE [continuing]. I think that our focus here—this really is a direct response to what we're hearing from people all over the country.

Right now they don't feel protected because they don't have access to information.

The growing health concerns are just beginning to be looked at by EPA, by the National Institute of Environmental Health, by the National Academy of Sciences.

I thought Mr. Liveris was very eloquent on this point that we're 4 or 5 years into a major boom that could take as much as a century.

Let's get it right at the start, and that's really what we're asking for.

Senator HOEVEN. Mr. Chairman, I'm going to ask for a little leniency on my 5 minutes given the length of time it took to get the answer questions and the length of some of the responses. So if you would please bear with me for just a minute.

Mr. Gerard, so in the conversation that Ms. Beinecke and I just had clearly whether it's hydraulic fracturing or other energy development, we develop different types of energy in different places in different ways around the country. That argues for a State-led approach with some Federal standard of, you know, basic safety and transparency, which I think captures your answer, which is exactly the kind of legislation that I've tried to put forward.

Why isn't that a good approach? What's the concern with that? Why do we run into resistance when we say State-led approach, but we have to recognize there are differences in different parts of the country and how we produce the energy and what we're doing so you allow flexibility rather than a Federal one-size-fits-all standard? Can you address that for me?

Mr. GERARD. Yes, I think there are a couple of factors that are—and it's a great point and goes back to Governor Hickenlooper and I wished he was still here to address this because he's dealt with it in Colorado where he's been able to harmonize all those different interests.

But I think part of the conversation is based, in my view, on a false premise. That premise is that somehow Washington is the best place to regulate. We shouldn't forget in these States which are the incubators of ideas with different hydrology and geology, there is no one more highly motivated to protect their water and to protect their air than the people who live in those communities, governed by their State regulatory activities, etcetera.

The phenomenon that we see today in the oil and gas business is one of increase in terms of activity. Hydraulic fracturing has been around for 65 years. We've drilled over 1.2 million wells with it, and as Lisa Jackson the administrator of EPA has said, here in the United States there's never been a confirmed case of groundwater contamination as a result of hydraulic fracturing.

So this myth, in my view, of somehow we've got to rush in and overlay a potential level of regulation that conflicts with the States who know best about hydrology, water quality, etcetera, and the geology they deal with—with their State geologist, we need to look

closely and look at those States and say what's taking place here today.

I'll tell you the States have moved very quickly. The State of Pennsylvania I mentioned earlier, they've modified their State's standards, regulatory legislative activity 4 times already to keep up with the fast-moving industry. The States have moved quickly. Governor Hickenlooper and others—they're very active, great blessing there, he gets it, he's a geologist, he's been part of it and he's been able in a very positive way to bring the different interests together and find the proper role where the States historically have led in regulating oil and natural gas.

Senator HOEVEN. OK, so for each one of you, and I'm wrapping up here, but I would like each one of you to respond with a State-led approach where you have that ultimate Federal backstop because I think this takes into account both your answers.

How do we get people working?

We've all agreed we need a comprehensive energy plan for this country. Governor Hickenlooper talked about it for his State of Colorado. I could spend a long time telling you about our State of North Dakota. Senator Murkowski could talk about Alaska. Each one is different, but each State is doing amazing things. We all want a comprehensive national energy policy, jobs, energy, the whole ball of wax, but we've got to give the flexibility and empower the private investment.

A State-led approach with this Federal transparency and backstop does exactly that. I'm building off both your answers.

How do we get consensus built in this committee and this Congress to get this legislation passed which myself and others are putting forward? How do we bring people together to get the consensus to do that? States-first approach, State-led approach with that Federal transparency and backstop.

Ms. Beinecke if you could start on that and just an answer from each of you, again, how do we get it done?

Ms. BEINECKE. Senator I think that——

Senator HOEVEN. We've been talking about it for years, how do we get it done?

Ms. BEINECKE. I would emphasize the important Federal role here because I think there is differentiation among the States.

I thought Governor Hickenlooper really identified what needed to happen is you need all the stakeholders at the table. Now the way a lot of these standards that have been developed at the States, the public is not at the table. The people that have concerns in their local communities in some places are not allowed to express those concerns. That's a situation we have in New York State right now. So if you have a process that really does bring all the stakeholders together to insure that the concerns that the public actually have and are very deeply concerned about are addressed as you work with the industry to see how this industry is going to be developed, that would be a good process.

I think up until this point a lot of concerned citizens have felt they haven't had a participatory role in the process and they're looking for one.

Senator HOEVEN. It seems to me that's what the whole comment process is all about that States have when they develop their laws

and regulations. I think that was what we were trying to do, but I'm about trying to reach out and get people working together here.

Mr. Gerard.

Mr. GERARD. Senator I'm just going to read 2 quick sentences, and this is Lisa Jackson, the administrator of the EPA, the vast majority of oil and gas production is regulated at the State level. Then she goes on to say, so it's not to say that there isn't a Federal role, but you can't start to talk about a Federal role without acknowledging the very strong State role. End quote.

My counsel would be as we look at the issues, let's identify the real issues, let's talk about the issues that are really a concern.

I take strong exception to what Ms. Beinecke said here. There's a very active, transparent process taking place in these States, and no place is it more evident than in the State of New York and what's going on up there in terms of citizens being involved, expressing their views and the Governors very active in taking all of this in.

So let's sort through some of our own perceptions, our own wishes of what should happen.

Let's look at the issues in light of the historic regulatory role for the States and identify if there is anything there we need to look at, but once again defer.

The States have done this well. Lisa Jackson said they're this well.

There's no reason for the Feds to step in, overlay it, and create conflict.

Senator HOEVEN. OK Mr. Eisenberg. Now you're going to explain in 2 sentences how we bring those 2 groups together and get her done.

Mr. EISENBERG. That's a very good question.

You know I think the one-size-fits-all approach, I mean there needs to be some trepidation on the part of the Federal Government to regulate without understanding the consequences of it.

How do we get those 2 groups together? Good luck. I mean it's starting——

Senator HOEVEN. But it's the key to a national energy policy that works, and Senator Wyden I think if anybody can do it, I think our Chairman's the kind of guy that can build that kind of consensus. So we've got to figure out how to do this.

Mr. EISENBERG. Yes, an—I mean, and we're certainly at the NAM certainly willing to work with the committee toward it, toward that sort of goal.

I mean we would like to see more bipartisanship energy issues. We don't think that energy, and particularly natural gas, should be a partisan issue. In fact, on this committee I don't view it as being that.

But we are certainly willing to work beyond that.

Senator HOEVEN. We'll need your help.

Thank you all very much.

The CHAIRMAN. I thank the Senator from North Dakota. I don't want to make this a bouquet-tossing contest, but I think the Senator from North Dakota has really put his finger on it because if you listen to how you described it, Senator, you talked about Federal transparency.

You talked about a Federal backstop and, of course, a very strong role for the States recognizing that there are differences. When you look at the architecture of the environmental laws, you see what the Senator from North Dakota described all over the place, essentially these Federal minimum standards and then a wide berth for the States to do their thing.

I was telling Senator Murkowski I came to the U.S. Senate in 1996, the first new senator from Oregon in 30 years. I had a full head of hair and rugged good looks and the first thing I voted for which dismayed some of my supporters, was for the Kempthorne Amendment, which in effect had what you all are talking about: a strong transparency and backstop role, but the States could do their own thing.

So I know that as we go back and forth on this, it looks like the gaps are insurmountable. But it looks like you 3 souls have been willing to stay here as we got up and came back and we got up and we came back. I so appreciate the good faith in terms of desire to figure this out and that's why Senator Murkowski and I are committed.

I'll just make 2 last points and let my colleague have the last word. On this point with respect to confidence, Ms. Beinecke, which I think is central, one of the ideas I have heard has a lot of bipartisan interest from both industry and environmental folks is if we can have a strong disclosure program, a program, for example, where people are going to really understand ahead of time, for example on fracking fluids and these kinds of things. I'm very interested in following up with you on that, and I think it's fair to say there are a lot of people in industry who see this confidence issue as extraordinarily important as well because there's tremendous concern. We're hearing about it from communities around the country, and if we can get some of these big elements right-like what the Senator from North Dakota talked about-how you can figure out how to have a strong disclosure program and maybe address some of the issues that Governor Hickenlooper brought up in connection with how you do it in addressing various concerns. I think we're on our way.

The last point I want to make is the reason Senator Murkowski and I are putting so much time into this- and we thought together about what we ought to proceed on first-is this issue has the potential to be a real American success story where in effect if we work together, have all the stakeholders at the table as you, Ms. Beinecke, said and the Senator from North Dakota has indicated to me he's more than open to, this has the potential to be an extraordinary success story, a story for the times, an American success story.

That's the objective we're going to take in the committee, and I'm going to let the last word go to my friend and colleague, Senator Murkowski.

Senator MURKOWSKI. Is this yours?

The CHAIRMAN. No.

Senator MURKOWSKI. See we're just so close we don't even know which microphone belongs to who.

Senator Wyden, I want to thank you for your summation comments and also to acknowledge where you have been taking us,

Senator Hoeven, in this discussion because I think we've had an opportunity here to have almost 3 hearings.

We started our overview of what natural gas has brought us in terms of the manufacturing renaissance, jobs, and the opportunity for reduced emissions.

As I point out in my Energy 20–20 document, it comes down to one bumper sticker and that is ENERGY IS GOOD. I think when we're talking about natural gas we recognize the benefits.

But we've also had a hearing for all intents and purposes talking about the issues as they relate to export of this now abundant resource and what that might mean to us and how we might deal with some of the concerns that have been raised here.

One of the things that I heard very clearly around the Dias, we want to be careful. We don't want to run out and do something precipitice that we might regret in terms of policy later. Let's make sure that we've got our eyes open and are mindful in terms of how we advance these issues.

Then the focus that Senator Hoeven has given us on the issue of hydraulic fracking and really what that has meant in terms of being able to access a considerable resource, but recognizing that in this amazing country of ours that this resource is not just situated in North Dakota. We've been utilizing hydraulic fracking on the North Slope for decades now without incident.

What Senator Manchin has been talking about regarding the opportunities in his part of the country, States like Ohio and Pennsylvania where people have been for decades and generations and never envisioned themselves as coming from an energy-producing State, and now all of a sudden they're in an energy producing State.

The dynamics that are going on right now within the energy sector are really quite profound so our responsibility is as a committee to thoughtfully take up these issues and consider all aspects of them, not rushing to judgment, but really allow good thoughtful discussion. I think that this is critically, critically important.

It's important that we look to our history when we talk about LNG exports. I'm always quick to remind folks that we've been doing it in Alaska for over 40 years now. The longest contract in the country for export of anything has been shipping natural gas to Japan. It's been a very quiet success story, and in 4 decades they've never missed a shipment. It was a remarkable run, and nobody really knows about it. That's probably a good thing. When it doesn't make the headlines, it's probably a good thing.

Mr. Chairman I want to—I want to commend you for how we started off our first hearing in this committee. Maybe all of them won't go until well after the expired hour, but I do think what we took up here today and the manner in which we addressed it is a good marker for how we can move forward on some very difficult policy issues, but I think policy issues that have an opportunity to really direct the economic future and well-being of our country.

The CHAIRMAN. Thank you, thank you.

With that the committee's adjourned.

[Whereupon, at 1:10 p.m., the hearing was adjourned.]

APPENDIXES

APPENDIX I

Responses to Additional Questions

RESPONSES OF ROSS EISENBERG TO QUESTIONS FROM SENATOR ALEXANDER

Question 1. Given the advantage of low domestic natural gas prices that resulted from increased production from unconventional natural gas reserves, do we really have a problem since we might only export 10 percent of our natural gas?

Answer. Thank you for this question. A great deal of the discussion at the hearing centered on finding a "sweet spot" for LNG exports. The NAM does not believe it is the role of the federal government to find the "sweet spot." If the market is allowed to work, the "sweet spot" should happen naturally.

The LNG export study commissioned by the Department of Energy (DOE) from NERA Economic Consulting helps illustrate this point. One of NERA's key findings-which often goes overlooked-is that in the scenarios NERA believes most likely to represent future conditions, we will not export large amounts of LNG because we will not have enough international customers willing to buy it at the price at which we would have to sell it to make a profit. Specifically, NERA states:

> NERA concluded that in many cases the world natural gas market would not accept the full amount of exports specified by FE in the EIA scenarios at prices high enough to cover the U.S. wellhead price projected by EIA. In particular, NERA found that there would be no U.S. exports in the International Reference case with U.S. Reference case conditions. In the U.S. Reference case with an International Demand Shock, exports were projected but in quantities below any of the export limits.[1]

DOE asked NERA to model price impacts of 6 and 12 billion cubic feet (bcf) of exports. NERA concluded that, unless production costs substantially declined or international demand spiked, the U.S. would be unable to export the full amount.[2]

Question 2. At what percentage of exports, compared with the overall U.S. production of natural gas, does the U.S. lose its price advantage of natural gas that we have today?

Answer. Strictly speaking, U.S. consumers of U.S.-produced natural gas will always have a price advantage over foreign consumers of U.S.-produced natural gas due to liquefaction and transportation costs. LNG export companies estimate that liquefaction and transportation of natural gas adds roughly six dollars per billion cubic foot (bcf); domestic consumers of this gas will therefore always have a six dollar price advantage over foreign consumers of this same gas.

Your question also asks whether there is a point at which LNG exports would cause U.S. natural gas prices to rise high enough that domestic manufacturers no longer take advantage of it. That is a much more difficult question, and unfortunately one that depends on much more than simply LNG exports. It will depend on a multitude of factors, including: whether we can continue to develop our vast natural gas resources efficiently and inexpensively, how much gas we ultimately use for electric generation for manufacturing and in the transportation sector, whether we will discover even more domestic natural gas reserves, how quickly other nations such as China increase their own natural gas production, and whether international demand for LNG exports will increase substantially. The NAM firmly believes that responsible development of natural gas, balanced by reasonable state-based regula-

[1] DOE 2012 LNG Export Study at 4.
[2] Id. at 76.

tion, a manageable permitting process, and a policy on LNG exports governed by free trade and open markets will ensure that the U.S. can export natural gas while maintaining a growing and vibrant manufacturing sector.

Question 3. What are your projections for the amount of natural gas the U.S. will be producing in 10 years?

Answer. The NAM has not made specific projections for the amount of natural gas the U.S. will be producing in 10 years. However, the PwC study supported by the NAM in December 2011, "Shale Gas: A Renaissance in U.S. Manufacturing," based its projection of one million manufacturing jobs that could be created from shale gas development in 2025 on the Energy Information Administration's estimate of 862 trillion cubic feet (tcf) of technically recoverable shale gas resources.

Question 4. Under present policies, if you had to make a guess, what would be the range of the percentage of U.S. natural gas production that we would be exporting in 10 years?

Answer. If the DOE's current policy-a full moratorium on new export licenses-were allowed to remain in place, we would be exporting the same amount of natural gas in 10 years that we do today: none.

That said, we do expect the DOE to move forward with licensing at some point. Again, the NERA study performed for the DOE is helpful because it clearly states that current market conditions will not allow for exports even at the 12 bcf level. If NERA is correct, the market will ensure that a balance exists between exports and domestic availability of natural gas.

JACK N. GERARD,
API, February 28, 2013.

Hon. RONALD WYDEN,
Chairman, Senate Committee on Energy and Natural Resources, 304 Dirksen Senate Building, Washington, DC.

DEAR CHAIRMAN WYDEN,

Thank you again for the opportunity to testify before the committee on the game-changing opportunity that we have before us through the development, use and export of domestic natural gas. The application of the proven technologies of horizontal drilling and hydraulic fracturing have allowed the United States to become the global leader in natural gas production, and we are on our way to becoming the global leader in oil production. This will enhance our energy security tremendously, considering that the U.S. will rely on natural gas and oil for decades to come for energy consumption, and the world will require significantly more natural gas and oil. Domestically, the story is compelling: the upstream oil and natural gas sector is now responsible for 1.7 million jobs in the country in unconventional resource development alone. And as I stated in my testimony to the committee, that number is expected to grow to 2.5 million jobs by 2015; 3 million jobs by 2020 and 3.5 million jobs by 2035. According to the Bureau of Labor Statistics, jobs in the oil and natural gas exploration and production sector pay on average more than $100,000 per year, more than twice the national average. As we move forward with this important debate, we must ensure that move down a path that fosters this important economic and job growth through responsible development of these resources.

RESPONSE OF JACK N. GERARD TO QUESTION FROM SENATOR WYDEN

Question 1. Ms. Beinecke noted in her testimony that one of the benefits of natural gas, of course, is that when you burn it; it releases fewer greenhouse gas emissions than resources like coal. This benefit, though, can be offset if more natural gas leaks in to the atmosphere. There are conflicting reports about the level of methane leakage from natural gas production and transport, ranging from as little as 0% leaked to as much as 9% in some reports for some basins. How can we get our arms around this question of how much methane is being leaked, and what are your thoughts for how we can make sure that leakage is minimized?

Answer. API is keenly aware of the widely divergent estimates of methane emissions from the U.S. petroleum and natural gas industry and has been working to improve methane emission estimates. Methane emissions associated with petroleum and natural gas production have been typically assessed by engineering estimation. Such estimates are typically used by EPA when compiling the national U.S. Greenhouse Gas (GHG) Inventory and more recently by companies for reporting under the mandatory Greenhouse Gas Reporting Program (GHGRP).

I. In order to make a comparison to "% leaked" as identified in Question 1 (Senator Wyden), the analysis in section I and II, reports methane emissions

per production as a comparable percentage.This variability of methane emission estimates extends to the official inventory of methane emissions in the annual U.S. GHG inventory prepared by EPA and submitted to the UNFCCC. This inventory estimates GHG emissions from various sectors including the Natural Gas Systems sector.[1] In the 2008 inventory (published in 2010), EPA estimated methane emissions from Natural Gas Systems to be 4,591 Gg of methane (96.4 Tg CO_2e) which equates to about 1.2%[2] of 2008 natural gas withdrawals[3] (production) from the natural gas industry. The 2009 and 2010 inventories (published 2011 and 2012 respectively) estimated significantly higher methane emissions with the 2010 inventory estimating methane emissions of 10,259 Gg (215.4 Tg CO_2e), equating to about 2.6%[4] of natural gas withdrawals from the natural gas sector. The majority of this increase was due to different assumptions and methodologies associated with the onshore natural gas production segment. The 2009 inventory played a significant role in public, policy, and regulatory debates surrounding methane emissions from natural gas systems. The 2011 inventory, released for public review on February 22, 2013, estimates methane emissions of 6,646 Gg (139.6 Tg CO_2e); equating to about 1.5%[5] of natural gas withdrawals from the natural gas sector.

The emission sources, and their respective methane emissions, included in EPA's calendar year 2011 inventory estimate are shown in the table provided in the supplemental technical information that follows on page 16.

II. Based on the 2011 data reported to EPA under the GHG Reporting Program (which is designed to capture 85-90% of the petroleum and natural gas operations in the U.S.) one can also assess a leakage rate for petroleum and natural gas operations. The data released in early February 2013 by the U.S. EPA indicates that methane emissions for all sources within the Petroleum and Natural Gas Systems category[6] are 83 million metric tonnes of CO_2 equivalents, which equates to an average methane leakage rate of about 0.7% of 2011 natural gas gross withdrawals.[7]

MEASUREMENTS OF METHANE EMISSIONS

In order to gather more information on methane leakage rates, and the adequacy of the engineering estimation methods, a series of studies is emerging over the past couple of years each providing a snapshot of leakage from a specific region and a specific segment of the natural gas system at a specific point in time.

I. Fort Worth, Texas Study, 2010[8].—Analysis of reported routine emissions from over 250 well sites (with no compressor engines) in Barnett Shale gas well sites in the City of Fort Worth was conducted for the City of Fort Worth by Eastern Research Group Inc. (ERG). The results revealed a highly-skewed distribution of emissions, with 10% of the well sites accounting for nearly 70% of total emissions. Natural gas leak rates were calculated based on operator-reported, daily gas production data at these well sites and ranged from 0% to 5%, with six sites out of 203 showing leak rates of 2.6% or greater due to routine emissions alone.

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[1] Natural Gas Systems is comprised of sources in production field operations (both onshore and offshore); natural gas processing; natural gas transmission and storage (including LNG); and natural gas distribution.

[2] Calculated based on 239,115 MMscf of CH_4 emissions divided by 20,026,832 MMscf natural gas withdrawals.

[3] Natural gas withdrawals mean EIA's gross gas withdrawals less associated gas from oil wells, which for 2008 withdrawals = 20,026,832 MMscf; 2010 = 20,981,382 MMscf; and 2011 = 22,571,108; http://www.eia.gov/dnav/ng/ng_prod_sum_dcu_NUS_a.htm

[4] Calculated based on 534,323 MMscf of CH_4 emissions divided by 20,981,382 MMscf natural gas withdrawals.

[5] Calculated based on 346,230 MMscf of CH_4 emissions divided by 22,571,108 MMscf natural gas withdrawals.

[6] Petroleum and Natural Gas Systems for EPA's GHG Reporting Program is comprised of sources in petroleum and natural gas production (both onshore and offshore); natural gas processing; natural gas transmission/compression; natural gas distribution; natural gas storage; LNG storage, import, and export; and other petroleum and natural gas combustion sources.

[7] Natural gas gross withdrawals is taken directly from EIA, which for 2011 = 28,479,026. This includes gross withdrawals from oil wells to be consistent with emissions reported under the GHGRP, which includes petroleum and natural gas production. http://www.eia.gov/dnav/ng/ng_prod_sum_dcu_NUS_a.htm

[8] Natural Gas Air Quality Study (Final Report), http://fortworthtexas.gov/gaswells/default.aspx?id=87074, Posted July 14, 2011, Updated July 19, 2011

II. Denver-Julesburg Basin, Colorado, February 2012[9].—A study by NOAA/University of Colorado scientists published in February 2012 suggested that up to 4% of the natural gas produced at a field near Denver was escaping into the atmosphere. The study relied on 2008 ambient concentration measurements, and estimated a leakage rate based on concentration ratios, using a methodology that remains in dispute. In a comment on this publication, Levi[10] questions the authors' assumptions about the composition of the gas being leaked and where it is coming from (methane from natural gas production or other hydrocarbon liquids from condensates). Levi's analysis underscores the uncertainty about the study's conclusion regarding methane leakage from natural-gas operations elsewhere.

III. Joint Institute for Strategic Energy Analysis (JISEA), November 2012[11].—This study of the Barnett Shale area was conducted by JISEA[12] and released in November 2012. The study analyzed 2009 emissions inventories of regulated air pollutants submitted to the Texas Commission on Environmental Quality (TCEQ) from more than 16,000 individual sources in shale gas production and processing sub-sectors. Based on the estimated methane content of this produced gas and the assumed average lifetime of production from a well, JISEA estimated a methane leakage rate—for the Barnett Shale basin—as 1.3% across its life cycle.

IV. Uinta Basin, Utah, December 2012[13].—In December of 2012, NOAA described the unpublished results of an airborne ambient measurement study in the Uinta Basin, Utah. The data was collected as part of a broad investigation of air quality in the Uinta Basin, using ground-based equipment and an aircraft to make detailed measurements, including methane concentrations. Using what we believe are simplified mass calculations and assumptions along with the aircraft concentration measurements, the researchers suggest that the rate of methane leakage may be as high as 9% of total production, when compared to industry production data. A paper detailing the study methodologies, data, and results has not yet been published or released.

V. University of Texas/EDF Study[14].—A measurement campaign was conducted in 2012 by the University of Texas at Austin (in collaboration with nine petroleum and natural gas industry corporate partners and EDF—Environmental Defense Fund) to quantify emissions from natural gas production. Our understanding is the results of this study will be published later in 2013.

CONCLUSIONS

Engineering estimation methods, source measurement methods, and ambient concentration measurement studies have inherent limitations and are associated with a considerable level of uncertainty. Each piece of information taken alone cannot provide an accurate picture of system-wide leakage, due to spatial and temporal variability. Great care is needed not to rely on partial data provided by various studies to-date, hence indicating the need for additional investigations.

Most notably, the science of estimating leakage rates from ambient concentration data is still evolving. The uncertainties and limitations of the various methodologies being used have yet to be independently validated and as such cannot be viewed as definitive measurements at this time. They should also be viewed as snapshots in time and location.

As Jeff Tollefson states in the journal Nature[15], "Whether the high leakage rates claimed in Colorado and Utah are typical across the U.S natural-gas industry remains unclear. The NOAA data represent a 'small snapshot' of a much larger picture that the broader scientific community is now assembling." API and its members

[9] Petron, G. et al. J. Geophys. Res. 117, D04304 (2012).

[10] M. Levi, Revisiting a Major Methane Study, October 2012; http://blogs.cfr.org/levi/2012/10/12/revisiting-a-major-methane-study/

[11] Natural Gas and the Transformation of the U.S. Energy Sector: Electricity. Logan, J., Heath, G., Paranhos, E., Boyd, W., Carlson, K., Macknick, J. NREL/TP-6A50-55538. Golden, CO, USA: National Renewable Energy Laboratory.

[12] The Joint Institute for Strategic Energy Analysis is operated by the Alliance for Sustainable Energy, LLC, on behalf of the U.S. Department of Energy's National Renewable Energy Laboratory, the University of Colorado-Boulder, the Colorado School of Mines, the Colorado State University, the Massachusetts Institute of Technology, and Stanford University

[13] Methane leaks erode green credentials of natural gas, Nature News, 02 January 2013; http://www.nature.com/news/methane-leaks-erode-green-credentials-of-natural-gas-1.12123#/b1

[14] What will it take to get sustained benefits from natural gas? http://www.edf.org/methaneleakage

[15] See http://www.gpo.gov/fdsys/pkg/FR-2013-02-21/pdf/2013-03988.pdf.

recognize the need to improve both the scientific understanding of the range of data being collected as well as operating practices that would minimize methane leakage.

Furthermore, it should be noted that implementation of the final Oil and Natural Gas Sector New Source Performance Standard (NSPS OOOO) will achieve significant reductions of methane as a co-benefit from regulating volatile organic compound (VOC) emissions. EPA estimated that the final rule will reduce methane by the equivalent of 19 to 33 million tonnes of CO_2. The use of Reduced Emission Completions (RECs) in the final rule, a process developed by industry to minimize emissions and maximize resource recovery, will significantly reduce emissions resulting from completion of gas wells. Over the long term, this rule will have an ever-broadening impact on our operations as new sources are regulated.

API recommends four steps:

1. Collaborative efforts between industry, government and academia to agree upon a common set of methane measurement methods and 'best practices' for relating ambient concentration measurements to source emissions in the field.
2. In-depth analysis of newly emerging data—from different studies around the country—to assess the range and regional variability of potential methane leakage and quantify the economic benefits from its capture for sale.
3. Collaboration between EPA, the industry, and stakeholders to mine the data reported under the GHGRP to improve methane emission estimates in the U.S. GHG Inventory along with improving the accuracy of methodologies in the GHGRP.
4. Evaluation of the impact of recently promulgated new source performance standards (NSPS) for the Petroleum and Natural Gas sector to forecast expected methane emissions reduction trends once the new regulations are fully implemented in 2015 and beyond.

RESPONSE OF JACK N. GERARD TO QUESTION FROM SENATOR LANDRIEU

Question 1. It is obvious that everyone testifying today recognizes the importance of environmental protection and responsible production. While regulation is a vital part of ensuring that natural gas production proceeds in a responsible fashion, it is also vital that industry play an active role in self-regulation. What efforts are you aware of that industry has undertaken to ensure that they operate in a safe and responsible manner?

Answer. The industry's commitment to excellence and continuous improvement in hydraulic fracturing operations is evident in its work to develop best practices for oil and gas operations. More than 65 of API's standards and recommended practices for completion of wells apply to hydraulic fracturing operations. And over the past several years, API has developed three additional new guidance documents uniquely tailored to hydraulic fracturing in order to offer additional guidance to operators. The API standards process, its work applicable to hydraulic fracturing operations, and recent outreach efforts are described below.

1. API's Standards Program.

API's standards program has been a recognized leader in the development and dissemination of industry standards since 1924. New API standards, certifications, and practices are developed through a broad-based, formal consensus process that allows companies, regulators, organizations, and other stakeholders to participate in an interactive dialogue, addressing both cutting-edge issues and regulatory needs. API is accredited by the American National Standards Institute (ANSI), and API undergoes regular program audits by ANSI. API's standards process utilizes the ANSI-approved API Procedures for Standards Development. This process ensures that there is openness in participation on API standardization committees; committee balance between users, manufacturers, contractors/consultants and government; consensus based documents (does not mean unanimity); and due process, within which all comments and objections must be considered. API standards are considered "American National Standards" for adhering to this process.

In part because of this openness and consistency, API's standards are the most widely cited in the petroleum and natural gas industries. More than 100 standards have been cited 270 times in U.S. federal regulations and 184 standards have been cited more than 3,300 times in U.S. state regulations. Without specific codification in state or federal legislation, the standards are not mandatory; however, they are widely respected indicators of strong operations and therefore routinely mandated by companies, service providers, and their insurers even where compliance is not legally required.

API's standards are evergreen and reviewed a minimum of once every five years. Announcements of upcoming standards work programs such as formalizing the cur-

rent hydraulic fracturing guidance are made in the U.S. Federal Register through an agreement with the U.S. National Institute of Standards and Technology, as well as API's own Web site to encourage diverse participation.

2. Work Applicable to Hydraulic Fracturing.

The industry understands that the integrity of wells and effective wastewater management is central to producing natural gas safely and responsibly. API's existing body of rigorous internationally recognized good practice supplements the extensive federal and state regulation governing virtually every aspect of resource extraction. More than 65 of API's existing standards and recommended practices for completion of wells apply to hydraulic fracturing operations. They address topics ranging from planning and design of wells to post-production reclamation.

a. Hydraulic Fracturing Operations-Well Construction and Integrity Guidelines.

API HF1 (currently undergoing revision as RP 100-1) addresses casing, pressure testing, and cement job evaluation (including cement bond logs on a selective basis). Safe and responsible development begins with strong wells, these standards and practices include, but are not limited to, pressure testing of cemented casing, cement bond logging, and inspections beyond those required by local permitting procedures. API HF1 incorporates existing API guidance such as API Specification 5CT (9th Edition, July 2011, pertaining to the design, manufacturing, testing, and transportation of casing and tubing) and API Standard 65 Part 2 Isolating Potential Flow Zones During Well Construction (2nd Edition, December 2010, covering best practices to isolate potential flow of hydrocarbons and other fluids throughout the hydraulic fracturing process). API HF1 speaks extensively about the variables operators should consider in planning and completing wells. These include local considerations (e.g., regional geology, pressure differentials, and temperature variations that affect cement slurry composition), as well as advances in technology.

It is important to note that constantly evolving data collection, analysis, and monitoring techniques offer operators access to an ever-improving array of real-time information about well activities. API HF1 emphasizes that wholly isolated, solidly constructed wells and conscientious monitoring are essential elements to responsible development.

b. Water Management Associated with Hydraulic Fracturing.

API HF2 (currently under revision as RP 100-2) identifies practices used to minimize the environmental and societal impacts from the acquisition, use, management, treatment, and disposal of water and other fluids used in hydraulic fracturing. This document focuses primarily on issues associated with hydraulic fracturing in deep shale gas development; however, its guidance also extends to many other applications of hydraulic fracturing technology, including shale oil development. In an attempt to address the development-related issues stemming from the increasingly urban nature of shale gas development and competing uses, API HF2 recommends that water quality be evaluated on a regional level throughout the planning and completion process. It also acknowledges opportunities for creative water use strategies (e.g., companies that have used treatment facilities to make water from non-potable aquifers appropriate for fracturing) and the continuously evolving possibilities for greener fracturing additives (e.g., stimulants like propane or ultraviolet antibacterial agents). API HF2 strongly encourages companies to conduct baseline water quality testing, and to continue periodic water quality testing throughout the fracturing process. Careful water management in fracturing can often help companies reduce costs, while protecting the environment. For example, on-site storage facilities and pipelines can help minimize truck traffic, thereby lowering the greenhouse gas footprint of the extraction process. Similarly, treating and recycling water for future fracturing projects can help eliminate community concerns about releasing treated produced water for public consumption while also reducing operator costs. Disposal options—whether through underground well injection or treatment at specially accredited facilities—vary according to region; however, the overarching theme of this document is that responsible operators are careful planners who consider the regional, state, and local environmental implications of every decision in the water use lifecycle.

c. Practices for Mitigating Surface Impacts Associated with Hydraulic Fracturing.

API HF3 (currently under revision as RP 100-2) summarizes the strategies to protect surface water, soil, wildlife, other surface ecosystems, and nearby communities. One of the great benefits of hydraulic fracturing is that a multi-well production site the size of a two-car garage regularly contains as many as five wells that can

produce gas for up to 40 years. This is one of the most compact footprints of any large-scale energy source. That being said, however, careful planning for on-site storage and stormwater management, as well as continuous site inspections of both equipment and liners can minimize the risk of any inadvertent surface discharge. Baseline water samples and advanced disclosure about the additives used in fracturing fluids can also help increase community comfort with operational activities. HF3 draws heavily on API Recommended Practice 51R.

d. General Environmental Considerations.

API RP 51R—Environmental Protection for Onshore Oil and Gas Operations and Leases, covers diverse operational areas, including the design and construction of access roads, the placement of well locations, and practices for restoring sites after production has ceased. Notably, Annex A of Recommended Practice 51R focuses on "Good Neighbor Guidance" and encourages operators to be proactive in protecting public safety and the environment, while respecting the property rights of all neighbors (e.g., the landowner, the surface user, and adjoining landowners) and communicating effectively with community stakeholders. These documents are available to the pubic online at www.api.org/oil-and-natural-gasoverview/exploration-and-production/hydraulic-fracturing.aspx and focus on some of the most pressing water management issues in hydraulic fracturing (e.g., baseline water quality sampling, and regional water planning). Additionally, they are currently being expanded thanks to additional input from industry and other stakeholders (including regulators) as they progress through API's open, ANSI-accredited standards review process.

3. Stakeholder Outreach.

The task of improving the industry's ability to respond to public concerns and to address issues important to communities and regions where shale gas development is occurring continues through efforts at the state, county and local levels. Toward that end, API is willing to work with local and regional governments to identify and publicize recommended practices for community engagement toward prevention, mitigation and remediation of surface impacts and effects upon communities from exploration and production activities. API has already engaged in outreach to various county governments to address specific issues brought to the attention of API by the county representatives.

In October 2011, API and its sister trade associations held the first in a series of technical workshops specifically devoted to analyzing and promoting industry guidance documents on hydraulic fracturing operations. The workshop was held in Pittsburgh, Pennsylvania and was open to industry members, community stakeholders, environmentalists, state and federal regulators, and journalists. Registration fees were reduced for nonprofits and community members to encourage participation. More than 250 individuals attended and contributed to active discussions throughout the workshop.

Based on the success of this model, API offered over 15 additional regional one-day workshops throughout 2012. These workshops offered a valuable opportunity to understand and address regional concerns, as well as educate regulators and the public about the considerable safety measures accompanying hydraulic fracturing operations.

These workshops were only one element of the ongoing dialogue that industry has with regulators about continually evolving good practices and effective regulations. Discussions occur regularly on a state-specific basis, as well as through organizations like the Interstate Oil and Gas Compact Commission (IOGCC) and the State Review of Oil and Natural Gas Environmental Regulations (STRONGER). STRONGER is an organization that specializes in recommending improvements to state regulatory frameworks.

At a variety of meetings, industry has shared existing good practices with state regulators, and discussed where improvements to state regulations could effectively provide additional safeguards for local communities and their water sources. These briefings have occurred in Ohio, Pennsylvania, West Virginia, and Michigan and will continue in these and other states, as long as regulators want to learn more about industry practices.

Building on momentum from previous recent efforts, API is also planning to continue outreach to both industry and regulators to foster a dialogue of collaboration and continuous improvement. Industry and government together must meet the challenge of developing our nation's shale gas endowment in a sustainable way over time in ways that protect the environment, respect other uses of lands and waters in the vicinity and that are appropriately tailored to the character and context of the regions in which shale gas development occurs.

With conventional well technology, development of shale energy would have been prohibitively expensive. However, horizontal drilling and hydraulic fracturing not only make harvesting shale resources commercially viable—they allow it to be done with remarkably decreased surface impacts.

The United States Department of Energy has recognized both hydraulic fracturing and horizontal drilling as advanced technologies that provide environmental benefits in a 1999 report entitled "Environmental Benefits of Advanced Oil and Gas Production Technology." According to DOE, hydraulic fracturing was first introduced in 1947 and "quickly became the most commonly used technique to stimulate oil and gas wells. . . . By 1988, fracturing had already been applied nearly a million times. Each year, approximately 25,000 gas and oil wells are hydraulically fractured." Since the release of that report, hundreds of thousands of additional wells have been hydraulically fractured. The report explains hydraulic fracturing results in optimized recovery of oil and gas resources, protection of groundwater resources, and less waste requiring disposal, while horizontal drilling results in less impact in environmentally sensitive areas, fewer wells needed to achieve desired level of reserve additions, less produced water and less drilling waste. Furthermore, as described above, the industry has actively developed standards and best practices for safe and environmentally responsible operations.

RESPONSES OF JACK N. GERARD TO QUESTIONS FROM SENATOR BARRASSO

On March 14, 2012, the then-Bureau of Land Management (BLM) Director, Bob Abbey, testified in the Senate that there has been "a shift [in oil and natural gas production] to private lands in the East and to the South where there are fewer amounts of Federal mineral estate."

Question 1(a). What specific steps should the Federal government take to make Federal public lands and Indian lands more competitive with private and state lands for the purposes of oil and natural gas production?

Answer. The federal government should take positive steps to increase the number leases issued on federal lands, to expedite the timeframe for completing environmental analysis, and expedite the timeframe for issuing permits to drill.

According to a study titled, "Employment, Government Revenue, and Energy Security Impacts of Current Federal Lands Policy in the Western U.S.", prepared for API by EIS Solutions of Grand Junction, Colorado, January 2012, which relies upon an examination of BLM Oil and Gas Statistics compiled in 2010 and 2011 (the EIS Solutions report):

- The number of new federal oil and gas leases issued by the BLM in Western states is down 44% from an average of 1,874 leases in 2007/2008 to 1,053 in 2009/2010.
- The number of new permits to drill issued by the BLM is down 39%, from an average of 6,444 permits to an average of 3,962.
- The number of new wells drilled on federal land has declined, 39%, from an average of 4,890 wells to 2,973.
- The economic downturn starting in 2007 is recognized as a factor contributing to these results. However, if market factors were the sole driver of the federal lands permitting slowdown, it would be reasonable to assume that non-federal drilling permits would generally track the trends occurring with their federal counterpart. But this is not the case.

We have attached the full report from EIS Solutions, which describes in further detail the significant decrease in leasing, permitting and the drilling of wells on federal BLM lands.

When comparing BLM statistics for the entire U.S. related to the years from 2008 to 2012, the numbers paint a similar portrait. Natural gas production increased on nonfederal lands nationwide and in Wyoming when comparing 2008 to 2012, but it decreased on federal lands in the same areas over the same timeframe. Nationwide, natural gas production increased from 42.1 bcf/day to 56.8 bcf/day on nonfederal land, and decreased from 8.4 bcf/day to 8.0 bcf/day on federal land. In Wyoming, natural gas production increased from 1.8 bcf/day to 1.9 bcf/day on nonfederal land, and decreased from 4.2 bcf/day to 4.0 bcf/day on federal land. In terms of total wells drilled, nationally the number of wells drilling on federal lands decreased from 5,044 in 2008 to 3,022 in 2012, which is a 40 percent drop. In Wyoming, federal wells drilled decreased from 2,275 in 2008 to 776 in 2012, which is a 66 percent drop. In terms of drilling permits issued, nationally the number of permits decreased from 6,617 in 2008 to 4,256 in 2012, which is a 36 percent drop. In Wyoming, federal permits issued decreased from 3,155 in 2008 to 1,229 in 2012, which is a 61 percent drop. This information is provided in a one-page attachment.

CERTAINTY AND TIMELINESS IN THE LEASING AND PERMITTING PROCESS:

For years, western producers have been frustrated by the uncertainty that the long timelines for operating on federal land create. From leasing through project approval and drilling permits, increasing regulatory requirements and often inefficient administrative processes increase time and cost while reducing the certainty producers need to create long term business plans for exploration, production and resource development. Policies and priorities vary widely from administration to administration, creating even more uncertainly and leaving companies unable to determine timelines and costs, raise capital, and to plan development. States and field offices operate under widely varying interpretations of regulations, and producers are subject to the different approaches among agency field offices that can add ad hoc requirements to permits that have no basis in law. Improving and clarifying current regulations was needed even before the addition of recently enacted leasing policies which added more redundancy to the process. In order to realize the full economic and jobs potential that western oil and natural gas offer, companies must have certainty in the process along with reasonable time and cost expectations to enable them to execute their business plans.

STREAMLINING THE TIMEFRAME FOR COMPLETION OF ENVIRONMENTAL ANALYSIS

Many large projects are held up in multi-year delays in processing and completing environmental analysis under the National Environmental Policy Act. The BLM should undertake reform to streamline the process so that smaller projects that may include a dozen or so wells do not take months and years to complete the associated analysis, and that larger projects that may include thousands of wells do not take 3 to 10 years to complete the associated analysis. We are including an analysis of NEPA delays that was completed by SWCA Environmental Consultants for the Western Energy Alliance for your consideration.

RE-EXAMINING AND RE-ENGINEERING THE PRESENT PERMITTING PROCESS

The government needs a reorientation of the federal onshore oil and natural gas program. This should include a comprehensive re-engineering and reform of the entire federal onshore process, including leasing, project NEPA analysis, and permitting, to ensure the timely, efficient, predictable and responsible development of federal energy resources. Comprehensive reform should take advantage of emerging technologies and best practices, eliminate redundancies, and explore market mechanisms for achieving environmental protection. Government should refrain from implementation of new regulations without careful examination of the cost and benefit of current regulations.

Question 1(b). Would you please explain how the BLM's pending regulations on hydraulic fracturing would push oil and natural gas production off Federal public lands and Indian lands and onto state and private lands?

Answer. States have demonstrated that they are in the best position to regulate oil and gas development and have a proven track record of regulating oil and gas activities. Governors Matt Mead (Wyoming), Susana Martinez (New Mexico), Gary Herbert (Utah), Jack Dalrymple (North Dakota), Brian Schweitzer (Montana) and Robert McDonnell (Virginia), as well as Attorney General Scott Pruitt (Oklahoma) have provided written statements that testify to the strong and efficient track record of states to regulate oil and natural gas production. States are in the best position to understand the unique aspects of their hydrology and geology to inform and tailor their regulations. Furthermore, states have demonstrated the ability to adapt their regulations to address any changes in oil and gas activities in a prompt manner.

When the BLM rule was originally proposed, we requested that the BLM reconsider the rules and recognize the strong oversight provided by existing state and federal regulations because conflicting or duplicative federal requirements would delay development of abundant oil and natural gas without providing additional environmental protection.

We believe that the need for the proposed rule has not been supported by technical or scientific information that demonstrate that present federal and state regulations are inadequate to assure that hydraulic fracturing of oil and natural gas wells drilled on federal public lands takes place in a safe an environmentally responsible manner. As we will explain further, API recommends that the proposed rule be withdrawn and that prior to promulgating a new rule, the BLM should undertake a careful analysis of the agency's current regulations, onshore orders and other administrative practices concerning the regulation of drilling, well completion and production operations in collaboration with state agencies with similar regu-

latory mandates, and organizations such as the Ground Water Protection Council and STRONGER (State Review of Oil and Natural Gas Environmental Regulations).

The record shows that there have been no incidents of contamination from hydraulic fracturing in over 1.2 million wells drilled over more than sixty years, and no groundwater contamination incidents from hydraulic fracturing operations that have occurred on federal public lands. Claims concerning the environmental and health impacts of hydraulic fracturing have turned out to be unsubstantiated or have resulted from activities or natural occurrences unrelated to hydraulic fracturing—the application of fluids under pressure for the purpose of initiating or propagating fractures in a target geologic formation in order to enhance production of oil and/or natural gas.

We are concerned that the BLM has yet to show that it has carefully examined the potential effects of the proposed regulation on the costs of drilling operations on federal and tribal lands, and whether such costs might discourage new investment in such drilling operations without significant environmental benefit. More importantly, BLM has not shown that it has carefully examined whether the proposed regulations will increase or decrease production of natural gas and oil resources on federal lands that belong to the American people and provide revenues to the U.S. Treasury. The energy sector represented by API supports 9.2 million jobs and 7.7 percent of America's GDP. Even as the overall economy weakened the past several years, and millions of jobs were lost, the oil and natural gas industry expanded and created more than 86,000 new American jobs since the recession began. The resource basins of the American West are projected to generate 1.3 million barrels of domestic oil and condensate production a day by the year 2020, an amount that exceeds the current daily oil imports from Russia, Iraq and Kuwait combined. These basins likewise hold the potential to produce 6.2 trillion cubic feet (Tcf) of natural gas annually by 2020, an additional one Tcf from 2010 levels. The benefits to the nation and the region in terms of capital investment, jobs and energy security from development of these resource basins, the majority of which underlie multiple use federal public lands, are enormous, especially in this time of economic uncertainty.

BLM states in the proposed rule's preamble that it has developed the rule in response to "public concerns" related to hydraulic fracturing activities. The preamble states that "[T]he resulting expansion of oil and gas drilling into new parts of the country as a result of the availability of new horizontal drilling technologies has significantly increased public awareness of hydraulic fracturing and the potential impacts that it may have on water quality and water consumption." Nevertheless, the agency has not shown that it has carefully examined whether those concerns are warranted based on the volume of information publicly available related to well stimulation activities that have occurred nationwide for decades. This operating record fails to show that actual instances of hydraulic fracturing operations have adversely affected public health or the environment. A rule of this significance should be based on facts, science, and engineering, not on unsubstantiated concerns that lack empirical demonstration. It has been long established that agencies must provide some factual basis for their policy decisions, and "that those facts have some basis in the record," or they are arbitrary and capricious.

As API noted in written comments provided to the Office of Management and Budget's Office of Information and Regulatory Affairs June 11, 2012, API believes that the estimate of benefits and costs associated with the BLM's proposed rule as described in the May 11, 2012 notice in the Federal Register is flawed and should be scrutinized and re-determined. The benefits of the proposed rule are overstated by unrealistic assumptions of baseline risks of subsurface contamination in the Low Environmental Risk Case and grossly unrealistic in the High Environmental Risk Case. The costs of implementing the proposed rule are understated by the assumption that there will be no additional delays in operations even though the proposed rule describes a number of additional approvals that will be required throughout operations to bring a well to completion, should the proposed rule be implemented. Rules that impose regulatory burdens and delay without net benefit are exactly the type of rules that the Administration has sought to prevent. See Executive Order 13563 (agencies "must" craft regulations "only upon a reasoned determination that [their] benefits justify their costs," that they "impose the least burden on society," and "maximize net benefits . . . ").

More recently, in its study "Future of Natural Gas," MIT examined the potential risks of hydraulic fracturing to groundwater aquifers and found that "no incidents of direct invasion of shallow water zones by fracture fluids during the fracturing process have been recorded." MIT based its conclusions on the environmental record of more than 20,000 shale gas wells drilled over a 10 year period. MIT reviewed the results of fracturing operations in the Barnett and Marcellus Shales and found

that in all cases the highest growth of the fractures remains separated from the groundwater aquifers by thousands of feet of formation.

In addition, former BLM Director Bob Abbey testified before Congress and stated that BLM "has never seen any evidence of impacts to groundwater from the use of fracking technology on wells that have been approved by" BLM. Director Abbey added that BLM believes "that based upon the track record so far, [hydraulic fracturing] is safe." Director Abbey's testimony on the safety of hydraulic fracturing is in accord with former U.S. Environmental Protection Agency (EPA) Administrator Lisa Jackson's testimony that there is no "proven case where the fracking process itself has affected water." The evidence to date supports the conclusion that hydraulic fracturing poses no risk of subsurface contamination—a conclusion with which BLM and EPA apparently agree.

Moreover, the relationship between hydraulic fracturing and drinking water resources is already the subject of a multi-year multi-million dollar research study currently being undertaken by the EPA. This national study includes a review of published literature, analysis of existing data, scenario evaluation and modeling, laboratory studies, and retrospective and prospective case studies. EPA released a 2012 progress report and will release the final report at the end of 2014.

API believes that the case has not been made for a federal, one-size-fits-all approach. Oil and natural gas exploration and production is currently regulated by comprehensive state and federal laws. These include laws regulating well design, water use, waste management and disposal, air emissions, surface impacts, health, safety, location, spacing, and operation. State regulation of oil and natural gas activities pre-dated federal regulation, and is particularly important because it allows laws to be tailored to local geology and hydrology. Organizations like STRONGER are available to help assess the overall framework of environmental regulations supporting oil and gas operations in a particular state, and could likewise be a resource for the BLM. States also exchange information on regulatory experiences and practices through periodic meetings of interstate organizations such as the Interstate Oil and Gas Compact Commission (IOGCC) and the Groundwater Protection Council (GWPC).

Question 2(a). Please explain how liquefied natural gas exports would:

Increase natural gas production and jobs in public land states, such as Wyoming, and Indian Reservations; and

Answer. Exporting LNG will open up new markets which will increase natural gas production, including additional production on private, state, tribal and federal lands and in Wyoming. LNG exports will create jobs in the oil and natural gas industry, as well as the industries supplying the oil and natural gas sector with materials, equipment, and labor. These jobs would be created by the activities associated with the construction and maintenance of liquefaction facilities and increased natural gas production that would be required to support export markets. Recent studies indicate that each bcf per day of production supports between 25,000 and 35,000 jobs. To put this in perspective, as a result of the current energy renaissance, the United States increased its production of natural gas from approximately 60 bcf/day in 2010 to approximately 70 bcf/day in late 2012, a significant increase to occur over just two short years.

Virtually all studies concur that natural gas production will increase to support export volumes. The NERA study finds that in all three baseline scenarios, natural gas production increases. The EIA has estimated that 60 to 70 percent of LNG exports will be from increased production, with about 75 percent of the increased production coming from shale gas. The production of additional unconventional natural gas will support the creation of many new jobs as highlighted by the series of studies recently released by IHS. For example, an IHS report estimated that in 2012, 36 Bcf/d of unconventional natural gas production already supports over 900,000 jobs.

A preliminary report by ICF International that modeled the impacts of LNG exports on the macro economy finds that there is a net gain in overall employment with LNG exports and that the jobs impact are larger the greater the export volumes. For example, in the mid-export case, where LNG export volumes reach about 8 Bcf/d by 2035, approximately 309,000 jobs are created in 2035. The preliminary report by ICF International shows that even in the manufacturing sector there is a net increase in jobs because potential losses are offset by gains related to building and supplying LNG and olefin plants with equipment, building and supplying of materials and equipment for oil and gas production and processing, and general economic growth. According to the preliminary ICF International report, in the mid-export case, where LNG export volumes reach about 8 bcf/d by 2035, manufacturing job growth reaches 31,000 jobs in 2035.

Other studies that have analyzed the employment impact of increased LNG exports conclude that the gains in jobs are greater than the losses. For example, in summarizing the employment of LNG exports, Levi concludes "The bottom line . . . is robust: job gains in directly affected markets are highly likely to be greater than job losses in markets hurt by higher natural gas prices." In addition, Levi noted that "Most jobs supported by exports will be in gas production and in its supplies—including in energy intensive areas like steel and cement. My study estimates that those jobs will be roughly an order of magnitude larger than the jobs lost due to higher natural gas prices."

We are including with our response the preliminary results from the ICF International analysis of the economic impacts of LNG exports, which includes information on the positive employment opportunities.

Question 2(b). Increase revenues (e.g., through severance taxes or royalties) to states, Indian tribes, and the Federal government?

Answer. Corporate income taxes accrue to both State and Federal governments from oil and natural gas development. Any time that production occurs on federal, state, or tribal lands, the respective government receives the added benefit of additional revenue that is associated with the bonus bids, rentals, and royalties. From a federal standpoint, oil and natural gas production has provided billions of dollars to the government, and the potential is there for the government to receive billions more if production opportunities are expanded. In fact, the oil and natural gas industry contributes over $86 million a day to the federal government and we have the potential to do much more. With LNG exports, the country would see expanded production to meet the additional demand. The potential is certainly there for this additional production to occur on federal, state and tribal land, and those governments would in turn benefit from the additional revenues accruing. A recent IHS report estimates that projected revenue from unconventional development alone could reach a cumulative $2.5 trillion by 2035 with roughly half going to the federal government and half to state and local governments.

RESPONSES OF JACK N. GERARD TO QUESTIONS FROM SENATOR ALEXANDER

Question 1. Given the advantage of low domestic natural gas prices that resulted from increased production from unconventional natural gas reserves, do we really have a problem since we might only export 10 percent of our natural gas?

Answer. We are hopeful that we do not have a problem given the undeniable benefits that will accrue to the nation as a whole with the export of LNG from the United States. However, the U.S. is in a global competition for the development of LNG export facilities. According to ICF International, the current world LNG liquefaction capacity is estimated to be approximately 37 Bcf/d.[16] A survey of under construction, planned, and proposed facilities around the world indicates approximately 49.6 Bcf/d of new liquefaction capacity could come online by 2025 outside of the U.S.[17] Approximately 11.3 bcf/d of capacity is currently under construction in Australia, Indonesia, Algeria and Angola. Add to that the fact that approximately 28.7 Bcf/d of U.S. liquefaction capacity has been proposed and you get a potential total world LNG capacity of 115 Bcf/d. The expected worldwide demand for LNG falls far short of that potential supply. Various projections show that expected world demand for LNG will be in the range of approximately 50 Bcf/d to 65 Bcf/d by the year 2025.[18] A significant share of the proposed liquefaction capacity may not be built (i.e., of the 45 proposed LNG import facilities for construction in the United States, only 7 were actually built).

Each day that we delay affirmative decisions on export applications puts U.S. projects at a competitive disadvantage in the global race to construct LNG facilities. Therefore, we must ensure that DOE acts expeditiously and moves forward with the approval of the pending applications so that we do not lose this critical opportunity.

Question 2. At what percentage of exports, compared with the overall U.S. production of natural gas, does the U.S. lose its price advantage of natural gas that we have today?

Answer. The expert analysis to date indicates that the U.S. will not lose its price advantage of natural gas under any of the scenarios examined. Testimony from representatives of industrial consumers demonstrates that the U.S. petrochemical industry can operate competitively if U.S. natural gas prices remain in the $6-8 range. In testimony before the Senate Energy and Natural Resources Committee in October 2009, Dow Chemical Company Director of Energy Risk Management Edward

[16] ICF International estimate for year end 2011 figure.
[17] ICF International estimate as of Dec. 2012 based on current project list.
[18] Poten, BG Group, Credit Suisse, Facts Global.

Stone stated that "U.S. petrochemical competitiveness depends on a multitude of factors, such as the relative cost of energy (including crude oil, coal, etc.), the relative cost of new facility construction, the strength of the economy in each global area, and the extent to which local industry is protected by local government policies. In general, we believe that if crude were in the $75-$100 range, and natural gas were available at a consistent $6-$8 dollar per MMBtu range, U.S. petrochemical facilities could be globally competitive." If this is the case, then according to Dow Chemical Company's own recent analysis, LNG exports should not jeopardize recent petrochemical industry expansion plans. As summarized by a May 2012 Brookings report, the reference natural gas price forecast for all recent major studies, projected total natural gas prices even with LNG exports are in a range from $5.10 to $7.21 per MMBtu, well within or below the $6-8 range. In the NERA study, all of NERA's reference case core scenarios projected prices below $7.50 per Mcf. NERA's unconstrained LNG export case, which reached an export level of over 15 Bcf/d, projected a natural gas price as high as $7.50 per Mcf, but only in 2030 or at the end of the forecast projection. Therefore, recent studies projecting natural gas prices, even with very high and unconstrained LNG export levels, do not forecast natural gas prices that jeopardize planned petrochemical industry investment.

In fact, the additional additive LNG costs of liquefaction and transportation create a natural ceiling on exports. For example, the NERA study compiled costs of exporting LNG from the U.S. Gulf Coast to various demand regions around the world. See Fig. 62 in the NERA report.[19] NERA estimates that the total LNG transport costs to Europe, Korea/Japan and China/India can range from $6.30 to $7.14 and $8.39 per MMBtu in 2015, respectively. If the U.S. Henry Hub natural gas prices are trading at $4, then U.S. LNG exports are economic in these consuming markets since the current prevailing LNG prices into Japan of about $16.50 per MMBtu is higher than the U.S. sourced LNG price of $11.14. If, however, U.S. Henry Hub prices rise to $10, then the price of LNG into Japan becomes greater than $16.50 per MMBtu effectively rendering U.S. LNG uneconomic. As Japan adjusts further to the tsunami impact on its nuclear power sector and LNG export projects come on stream around the world, the tsunami-impacted price of $16.50 is likely to decrease. If the price of LNG delivered to Japan were to drop to, say, $11.00, the incentive to export from the U.S. could disappear.

The NERA study is one of the few studies to date that has incorporated the potential supply response by foreign competing suppliers of LNG that would limit the ability of the U.S. to export volumes of LNG.[20] According to NERA*, this consideration proved to be quite important since in many of the hypothetical LNG export volumes considered in the EIA study*, the world market could not fully absorb the export volumes due to strong international competition from foreign LNG and natural gas thereby further limiting the potential for domestic price increases. Medlock summarizes this point by stating that "the analysis herein indicates that international market response will ultimately limit the amount of LNG that the US exports as a matter of commercial rationing."[21]

Brookings' Study-by-study comparison of the Average Price Impact from 2015-2035 of 6 bcf/day of LNG exports (unless otherwise noted):

Question 3. What are your projections for the amount of natural gas the U.S. will be producing in 10 years?

Answer. As a trade association, API defers to the opinions and projections of the experts in the government and in the energy consulting business when it comes to future production. An analysis of projections of natural gas production from these organizations indicates that the U.S has an abundant natural gas resource base and outlook for natural gas production is more than sufficient to accommodate LNG exports as well as growing domestic demand. For example, the U.S. Energy Information Administration (EIA) projects that natural gas production will reach 78 bcf/d by 2025 in their latest AEO 2013 ER. In AEO 2012, the EIA was projecting 72 bcf/d of natural gas production by 2025, while in the AEO 2011, the EIA was projecting 66 bcf/d. (The AEO 2011 is the baseline that the EIA and NERA Consulting used in their analysis of the impact of LNG exports.) The upward trend in the outlook for natural gas production in the recent AEOs indicates the positive prognosis for shale gas and the continued expectation of robust supply growth in the next 10

[19] NERA, "Macroeconomic Impacts of LNG Exports from the United States," December 10, 2012, p. 90.

* All reports have been retained in committee files.

[20] The Jan. 2013 Deloitte study, "Exporting the American Renaissance; Global Impacts of LNG Exports from the United States," also analyzes international markets.

[21] Medlock, K.B. III, "U.S. LNG Exports: Truth and Consequence," James A. Baker III Institute for Public Policy (Aug. 10, 2012), pp. 32-33.

years. Commercial forecasters are even more optimistic than the EIA. ICF International and IHS Inc. project 88 bcf/d and 89 bcf/d of natural gas production by 2025.[22] [23] Since commercial forecasters are continuously updating their assumptions on such parameters as well spacing, estimated ultimate recovery, and other factors that affect the outlook for natural gas supply, it is reasonable to conclude that the outlook for natural gas may be even rosier.

Question 4. Under present policies, if you had to make a guess, what would be the range of the percentage of U.S. natural gas production that we would be exporting in 10 years?

Answer. Similarly, API defers to the experts on the question of projected future exports. EIA currently projects that the U.S. will be exporting 3.4 bcf/d of natural gas by 2025. This of course will be contingent upon a host of complex factors that will play out in the global market, including global supply, global demand, and global LNG export capacity. However, API will reiterate its concern that our potential to export natural gas from the U.S. becomes less likely with each day that we delay the approval of LNG export applications.

It is important to point out that the U.S. has demonstrated the ability to increase production significantly over a short period of time. In early 2006, U.S. marketed natural gas production was under 52 billion cubic feet per day (bcf/d). By late 2012, U.S. marketed production grew by over 18 bcf/d to 70 bcf/d, which equates to a 36 percent increase in seven years. The growth rate for U.S. natural gas production was even greater in 2010 and 2011. From January 2010 to January 2012, U.S. production grew by over 10 bcf/d or 18 percent in just two years. These production increases are larger than many projections of the volume for LNG exports, and this demonstrates that the capacity is clearly there for the U.S. to increase domestic production of natural gas to satisfy the demands of the export market, while at the same time providing affordable supplies domestically.

CONCLUSION

Once again, it was a privilege to have the opportunity to highlight the tremendous opportunity that we now have before us given our nation's emergence as a global energy leader. The oil and natural gas industry stands ready to harness this great potential and help the country realize the important and significant benefits to be gained, which include the creation of thousands of jobs, the generation of government revenues, and enhanced energy security.

[22] ICF International, "ICF Base Case," February 2013.

[23] IHS Inc., "IHS America's New Energy Future: The Unconventional Oil and Gas Revolution and the U.S. Economy," October 2012, p.15.

Supplemental Technical Information

The table below is based on the data provided in EPA's U.S. GHG Inventory Report for 1990-2011, which was released for public comment on February 22, 2013.

2011 EPA National GHG Inventory

	CH_4 Emissions as Tg CO_2e (million metric tonnes)	
Natural Gas Systems		
Field Production	48.3	
Processing	19.6	
Transmission and Storage	43.8	
Distribution	27.9	
TOTAL	**139.6**	**CH_4 Emissions as Tg CO_2e**
	346,230	CH_4 Emissions as MMscf
2011 Natural Gas Withdrawals	22,571,108	MMscf natural gas withdrawal volume
CH_4 leakage rate (relative to natural gas withdrawal volume)	1.5%	

The 2011 data reported to EPA's Greenhouse Gas Reporting Program (GHGRP) indicates 83 million metric tonnes of CO_2-equivalent are methane emissions for the eight industry segments covered under the Petroleum and Natural Gas Systems. These eight segments are: onshore petroleum and natural gas production; offshore petroleum and natural gas production; onshore natural gas processing; onshore natural gas transmission/compression; underground natural gas storage; LNG operations and storage; and Local natural gas distribution.

The equation below illustrates the conversion of methane emissions from a mass basis to a volume basis (the same conversion factors were used to convert the emissions data from the National GHG Inventory in the table above).

$$83 \times 10^6\ tonnes\ CO_2e\ (CH_4\ emissions) \times \frac{tonne\ CH_4}{21\ tonnes\ CO_2e} \times \frac{1000\ kg}{tonnes} \times \frac{scf\ CH_4}{0.0192\ kg\ CH_4} \times \frac{MMscf}{10^6\ scf}$$
$$= 205{,}853\ MMscf\ CH_4$$

Where, the 0.0192 kg/scf CH_4 density is taken from 40 CFR 98.233(v) of the Subpart W mandatory reporting rule for petroleum and natural gas systems.
Dividing the volumetric CH_4 emissions reported for the GHGRP by the total 2011 natural gas gross withdrawal volume (EIA) equates to a ***leakage rate of 0.7%.***

RESPONSE OF JOHN W. HICKENLOOPER TO QUESTION FROM SENATOR WYDEN

Question 1. Last week, I sent a letter to the Secretary of the Interior and to the White House encouraging the Administration to issue a strong regulation for hydraulic fracturing on Federal lands. At least four states (Wyoming, Arkansas, Idaho, and Montana) have a requirement for disclosure of the anticipated contents of the fracking fluid prior to the operation taking place. Colorado decided against that approach. What was the state's reasoning?

Answer. We heard from operators that they sometimes alter the contents of the fracking fluid at the last minute. It made sense to require the disclosure after the operation to avoid the unnecessary cost and confusion resulting from amending reports, especially since it didn't seem to the Colorado Oil and Gas Conservation Commission ("COGCC") that in the end there would be any substantive difference in the information that COGCC obtained.

RESPONSE OF JOHN W. HICKENLOOPER TO QUESTION FROM SENATOR LANDRIEU

Recently, BLM announced that it would be issuing a new version of a proposed rule regulating hydraulic fracturing on Federal lands. This would be a revision of an earlier proposal that threatened to drastically increase the cost of hydraulic fracturing on Federal lands. I am hopeful that this new rule will represent a more level-headed approach to regulation, one that leaves the final authority to regulate in the hands of states, who have successfully managed hydraulic fracturing for over 60

years, with the help of the production industry, which has created a system of disclosure and self-regulation resulting in increased safety and public awareness.

Question 1a. Given the successful track record of states and industry regulating the process of hydraulic fracturing, do you agree that it makes the most sense to retain final authority in the hands of states, recognizing that government would assist in the creation of broad standards, rather than ceding total control to the Federal government?

Answer. We don't believe there is no role for the federal government, but, on balance, we believe the states are better positioned to regulate effectively. Given differences in geology, as well as development patterns, locations and drilling intensity, a "one size fits all" approach is not as efficient as state-by-state regulations. In January 2012, Colorado passed one of the strongest rules in the country for disclosure of hydraulic fracturing fluids and since then many other states have followed Colorado's lead. If the federal agencies do proceed with rules, we would hope that they look to the state rules as models, defer to states that meet certain regulatory control thresholds and avoid duplication of the regulatory process in terms of paperwork and other aspects of permitting and control.

Question 1b. Do you believe that increased Federal regulation would result in a decline in production activities, negatively affecting the economies of many communities which rely on these industries for economic support?

Answer. Increased regulation does not necessarily result in a decline in production activities. In Colorado, we have undergone three rulemakings: a regulatory overhaul in 2008; hydraulic fracturing disclosure in 2012; and this year COGCC adopted rules for setbacks and groundwater monitoring which are among the strongest in the country. Regulations must constantly evolve to accommodate changing development patterns and technologies and, in Colorado, production has not declined as a result of these rules. Nevertheless, for the reasons stated above, we do think the states are best suited to establish their regulatory frameworks. In Colorado, we believe that we can best ensure our natural resources and environment are protected, while fostering the responsible development of oil and gas resources.

RESPONSES OF JOHN W. HICKENLOOPER TO QUESTIONS FROM SENATOR ALEXANDER

Question 1. Given the advantage of low domestic natural gas prices that resulted from increased production from unconventional natural gas reserves, do we really have a [domestic price] problem [if U.S. exports increase] since we might only export 10% of our natural gas?

Answer. We understand that there is intense debate over the future of U.S. natural gas exports. Proponents say increased exports would create thousands of jobs, reduce the trade deficit and enhance national security. Opponents argue shipping large amounts of natural gas abroad could cause price hikes for consumers and manufacturers, many of which have benefited from recent low natural gas prices.

A December 2012 study commissioned by the U.S. Department of Energy and conducted by NERA Economic Consulting found that U.S. natural gas prices will increase when the U.S. exports liquefied natural gas (LNG[1]). They conclude, however, that the global market will limit how high U.S. natural gas prices can rise under pressure of LNG exports. This report projects that in spite of limited price fluctuations, even in the most extreme exporting scenario, the U.S. will gain net economic benefits from allowing exports. In every one of the market scenarios examined, net economic benefits increased as the level of LNG exports increased.

Question 2. At what percentage of exports, compared with the overall U.S. production of natural gas, does the U.S. lose its price advantage of natural gas that we have today?

Answer. This is a very complex question since there are several factors that influence the future price of LNG exports from the U.S. into world markets, including global supply and demand conditions and the future availability of shale gas in the U.S. The same study referenced above, conducted by NERA Economic Consulting and commissioned by the U.S. DOE, provides an analysis of natural gas prices in the U.S. relative to several different export scenarios. The study concludes that natural gas price changes attributable to LNG exports remain in a relatively narrow range across the entire suite of export scenarios studied. Natural gas price increases at the time LNG exports begin could range from zero to $0.33 in 2010 dollars per thousand cubic feet (2010$/Mcf). The largest price increases that would likely be observed after 5 more years of potentially growing exports could range from $0.22 to $1.11 (2010$/Mcf). The study employs a complex macroeconomic model to derive

[1] NERA Economic Consulting, Macroeconomic Impacts of LNG Exports from the United States, December 2012.

these estimates and corresponding export percentages are not clearly identified in the report.

Question 3. What are your projections for the amount of natural gas the U.S. will be producing in 10 years?

Answer. We must defer to national experts on projections for the amount of natural gas the country will be producing in the next decade. The U.S. Energy Information Administration (EIA) is the statistical and analytical agency within the U.S. DOE and their products are independent of approval by any other officer or employee of the U.S. Government. EIA's 2012 Annual Energy Outlook projects that natural gas production in the U.S. will increase by three trillion cubic feet (Tcf) in the next decade, to approximately 26 Tcf in 2023.[2]

Question 4. Under present policies, if you had to make a guess, what would be the range of the percentage of U.S. natural gas production that we would be exporting in 10 years?

Answer. Many factors within the global natural gas market will affect U.S. exports, including international supply and demand for natural gas. Again, we must defer to national experts on projections of U.S. natural gas exports in the next decade. The EIA's 2012 Annual Energy Outlook projects that natural gas exports will be approximately 3.32 Tcf in 2023, which would be just under 13% of U.S. production.[3]

RESPONSES OF ANDREW N. LIVERIS TO QUESTION FROM SENATOR MURKOWSKI

Question 1. Dow stated previously before this committee (2009) that U.S. petrochemical facilities could be globally competitive if U.S. domestic prices fell within the $6-$8 per MMBtu range. Has your position changed today and if so, can you explain why?

Answer. Dow's statement relates to competitiveness, which is a function of several interdependent variables. There is no absolute price range that can guarantee competitiveness. When making investment decisions, we look at the following parameters with respect to feedstock and energy costs: the expected absolute cost, the cost relative to competing geographies/the world price of oil, and volatility. The expected absolute cost must be lower than our other geographic alternatives. The same is true for volatility. Price and volatility are generally a function of supply/demand balance but can be subject to market shocks and distortions.

Question 2. You indicated in testimony before this committee that you support the requirement for a public interest determination to obtain a license to export LNG to non-FTA countries, particularly because natural gas is utilized by certain industries as a feedstock. Do you support a similar public interest determination for exports of products that other industries in the U.S. may use for value-added products? If not, why not? Why should LNG exports be regulated differently than other exports?

Answer. Over 70 years ago, Congress determined that natural gas exports should be measured against the public interest and enacted into law an export licensing regime to require that natural gas exports not be inconsistent with the public interest. The rationale for this action in the Natural Gas Act was that natural gas is a strategic commodity that has a critical impact on the well-being of consumers, the health of the economy, the security of the nation and other public interests. States and the federal government have enacted policies that virtually compel consumers to purchase natural gas, whether through environmental regulations or mandated fuel switching. The same cannot be said for other commodities, making natural gas fundamentally unique.

Dow, as just one of many affected constituencies, has submitted comments to the DOE dated January 24, 2013 and February 25 2013 urging DOE to take the steps necessary to ensure that, the licensing of natural gas exports fully meets the public interest.

RESPONSE OF ANDREW N. LIVERIS TO QUESTION FROM SENATOR LANDRIEU

Dow is one of several companies which have greatly benefitted from increased natural gas production, with this new, affordable source of gas allowing your company to invest billion in my state and others, reopening one facility and planning more. You have expressed a desire to see that natural gas exports are managed in a responsible manner, so as not to place undue burden on American manufacturing.

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[2] U.S. Energy Information Association, U.S. Department of Energy, Annual Energy Outlook 2012, http://www.eia.gov/forecasts/aeo/tables_ref.cfm.

[3] Ibid.

One of your key points has been the number of proposed export facilities, which, if all were approved and operating at full capacity, would represent 19 bcf per day of export, almost 1/3 our current demand. However, many believe that this figure is not achievable and will be limited by the capital available to finance construction. Indeed, in a New York Times article published January 5, Charif Souki, CEO of Cheniere, one of the companies proposing an export terminal predicted that by 2018, the country would manage to export only one billion to two billion cubic feet of gas a day, or roughly 2 percent of current domestic consumption. In 10 years, after two to four projects have received permits and have been built, he said he expected exports to grow to three billion to five billion cubic feet a day.

Question 1. Do you believe that a market-determined level of export, reflecting the realities of financing and market entry, could be maintained without placing undue pressure on manufacturers like yourself who are poised to invest billions in new and existing facilities?

Answer. It is critical to remember that although natural gas is a newly abundant resource, natural gas exports should not be viewed in isolation from the overall dynamics of the aggregate natural gas market. In fact, it is important to note that there are currently 29.4 bcf/d of LNG export projects that have applied to the DOE. Before acting on export applications, DOE should establish criteria and metrics for natural gas export public interest determinations required by the Natural Gas Act through an open process that elicits input from the broad spectrum of affected U.S. stakeholders. Established criteria and metrics will enable DOE to consider, based on appropriate data, projections and analysis, anticipated demand and the supply needed to maintain market balance (among other factors). An approach that rushes toward exports without a full understanding of the implications builds higher risk into the system and will change how investors plan for the future.

Further, we do not believe that financing will be a limiting factor as many have suggested. As evidence, financing for LNG projects in Australia has not been a factor despite having relatively higher natural gas prices. In fact, the Ichthys LNG projects recently announced the biggest projected financing ever arranged in international financial market at roughly US$20 billion. The role of export credit agencies in financing projects cannot be discounted. Financing was not an issue in overbuilding LNG import facilities in the U.S. not so long ago.

We believe the normal dynamics of a market for domestic natural gas can co-exist with preserving the public interest so long as abrupt shocks, such as severe speculative price volatility, and major artificial distortions, such as cartel pricing, can be ameliorated. This is the challenge facing DOE: how to balance natural gas exports with all of the other aspects of the public interest in the short, medium and the long term.

RESPONSES OF ANDREW N. LIVERIS TO QUESTIONS FROM SENATOR BARRASSO

Question 1. In your testimony, you express concern about environmental regulations. You state "overly restrictive environmental regulations.on hydraulic fracturing could greatly reduce future supplies of natural gas." You also "urge caution in considering policies that encourage fuel switching between natural gas and coal." To what extent is DOW concerned about: (a) Federal hydraulic fracturing regulations; (b) EPA rulemakings that encourage fuel switching between natural gas and coal; (c) a tax on carbon emissions; and (d) proposals to establish a clean energy standard?

Answer. We are concerned about governmental actions that would restrict supply and/or accelerate demand because of the potential impact on domestic natural gas prices. We believe it is critical that DOE, in making its public interest determination under the Natural Gas Act, consider the impact of all policies that could affect either supply or demand.

We are also concerned about policies that would rapidly and excessively drive coal and other energy sources out of power generation. We firmly believe that the nation's interest is best served by maintaining robust diversity in power generation sources. Dow has and will continue to evaluate any climate change policies in the context of its effects on U.S. competitiveness in general and energy sources such as natural gas. We would be very concerned about any policies that call on a single fuel source to carry a disproportionate share of the nation's energy burden. History shows us that whenever we have done so, we have been disappointed.

RESPONSE OF ANDREW N. LIVERIS TO QUESTIONS FROM SENATOR ALEXANDER

Question 1. Given the advantage of low domestic natural gas prices that resulted from increased production from unconventional natural gas reserves, do we really have a problem since we might only export 10 percent of our natural gas?

Answer. There is a significant level of uncertainty regarding exports and the broader natural gas market, and the stakes are quite high. Some parties claim that exports will not exceed 10 percent of natural gas production; we believe that it is quite likely that higher levels of exports would occur. DOE has already approved natural gas exports accounting for well over 50 percent of annual production. If even a significant portion of that already-approved volume is exported, then exports could easily exceed 10 percent of production. Approval of pending LNG export applications would permit LNG exports to flow to non-FTA countries that have markedly more demand for U.S. natural gas, making it far more likely that a higher percentage of production would be exported, with potentially severe consequences for domestic users of natural gas.

Given the threat of exports at that level, broad issuance of natural gas export permits could lead to natural gas price spikes. Speculation in natural gas trading has in the past driven the price up beyond what the purely physical market would indicate. This is what drove prices up in the last decade. Therefore, the price movement would likely occur well before the actual exports occur, due to expectations in the market.

In these circumstances, we believe DOE should take a cautious and measured approach to assuring an appropriate balance between natural gas exports and the public interest based on criteria and metrics established through a public comment process.

Question 2. At what percentage of exports, compared with the overall U.S. production of natural gas, does the U.S. lose its price advantage of natural gas that we have today?

Answer. We believe that the domestic demand for natural gas is going to increase significantly over the next 10 to 15 years and we are skeptical that supply will be able to keep pace. Accordingly, we see prices increasing from their current levels regardless of the level of exports. Exports will constitute additional demand and will serve to move prices even higher than they would otherwise be. Today we might be able to export 10 percent of our production without a significant impact on price. In out years, that may not be the case. Our analysis shows the potential for significant demand spikes in the 2017-2020 timeframe, and that an unprecedented level of production will be needed to balance the market. In a supply-constrained market, or even a balanced market, exports will have a far greater price impact than they would in a market with ample supply such as now. Australia currently exports roughly half of its natural gas production and in doing so it has imported much higher natural gas prices, placing its energy-intensive industries in a difficult competitive position and subjecting its population to much higher energy costs.

We believe that exports of natural gas should not be viewed in isolation from the overall supply/demand dynamics of the aggregate natural gas market. Indeed, current law requires exactly just such an evaluation prior to approval of natural gas export applications. Congress and the administration should work to define what is in the public interest to determine a prudent and rational approach that balances the interests of the American consumer and domestic needs with exports. Rather than a particular level of exports, Dow advocates movement beyond a single report by one economic consultancy to an open process to enable the full profile of U.S. stakeholders to provide economic and non-economic input to DOE to inform establishment of criteria to make public interest determinations. We are in year 4 or 5 of a 100 year energy advantage. There are still many unknowns, so we should exercise prudence as we move ahead.

Question 3. What are your projections for the amount of natural gas the U.S. will be producing in 10 years?

Answer. Dow is not a natural gas producer, but rather we are one of the world's largest consumers. For that reason, our focus is on understanding demand first and then the supply that would be required to maintain balance. Our analysis shows the potential for significant disconnect of demand from supply in the 2017-2020 timeframe in a high export case, and that an unprecedented level of production will be needed to balance the market without harming manufacturers and raising prices significantly for consumers. With regard to increasing supply/production, it is currently unclear how quickly this can happen and at what cost.

Question 4. Under present policies, if you had to make a guess, what would be the range of the percentage of U.S. natural gas production that we would be exporting in 10 years?

Answer. Natural gas is a vital and finite natural resource that plays a significant role in the overall health of the U.S. economy. Under present policy, the DOE is required by law to determine whether export applications are in the public interest and the level of exports in 10 years will in large part be based on that determination. We believe DOE needs more information in order to accurately assess the pub-

lic interest and determine an appropriate balance with the public interest. Dow is asking DOE to solicit additional comments regarding the impact of natural gas exports on jobs, consumer energy prices, trade levels, environmental issues, and U.S. energy independence and to establish public interest criteria against which to measure exports.

However, as noted above, our analysis shows the potential for significant demand spikes in the 2017-2020 timeframe, and that an unprecedented level of production will be needed to balance the market without harming manufacturers and raising prices significantly for consumers. It is for the reason that we are urging a cautious approach.

RESPONSE OF FRANCES BEINECKE TO QUESTION FROM SENATOR WYDEN

Question 1. Ms. Beinecke, you note in your testimony that one of the benefits of natural gas, of course, is that when you burn it, it releases fewer greenhouse gas emissions than resources like coal. This benefit, though, can be offset if more natural gas leaks in to the atmosphere. There are conflicting reports about the level of methane leakage from natural gas production and transport, ranging from as little as 0 percent leaked to as much as 9 percent in some reports for some basins. How can we get our arms around this question of how much methane is being leaked, and what are your thoughts for how we can make sure that leakage is minimized?

Answer. Natural gas contains less carbon per unit of energy than coal and thus produces fewer greenhouse gas emissions per unit of useful electric or thermal output when combusted.[1] But that is not the whole picture—natural gas operations also emit significant amounts of methane, a powerful greenhouse gas, during the extraction, production, processing, transmission, and distribution steps.

According to most comparative lifecycle assessments of greenhouse gas emissions during electricity production from natural gas and coal, natural gas would produce approximately 50 to 60 percent fewer emissions than coal, if there were no methane emissions at all from the natural gas industry.[2]

However, when the impact of methane emissions from the natural gas industry is included in the analysis, it can be estimated that natural gas provides a clear advantage over coal only when methane emissions as a fraction of total production are below 3 percent. When emissions are between 3 percent and around 7-8 percent, natural gas does not have an advantage over coal in the near-term, from a greenhouse gas perspective; this is because methane leakage has more deleterious effects in the nearer term. When emissions exceed 7-8 percent, natural gas has no advantage over coal at any time, from a greenhouse gas perspective.[3] The numbers above are for electricity generation from natural gas or coal; when using these fuels directly for useful thermal output, natural gas squanders its advantage over coal from a greenhouse gas perspective at even lower methane leakage levels.

In its latest comprehensive inventory, the EPA estimated methane emissions from the oil and gas industry to be about 2.5 percent as a fraction of total production.[4] Recent studies have suggested that emissions could be much higher, in the range of 7 percent or higher in certain basins.[5] The oil and gas industry claims that industry-wide emissions may be even lower than EPA's current estimate. Also, EPA recently released the first set of greenhouse gas emissions reporting data from the oil

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[1] U.S. Environmental Protection Agency, Clean Energy - Air Emissions, available at http://www.epa.gov/cleanenergy/energy-and-you/affect/air-emissions.html.

[2] Deutsche Bank Group-DB Climate Change Advisors, Comparing Life-Cycle Greenhouse Gas Emissions from Natural Gas and Coal (2011), available at http://www.worldwatch.org/system/files/pdf/Natural__Gas__LCA__Update__082511.pdf.

[3] Alvarez, R. et al., Greater focus needed on methane leakage from natural gas infrastructure, published in Proceedings of the National Academy of Sciences (2012), available at http://www.pnas.org/content/early/2012/04/02/1202407109.abstract.

[4] U.S. Energy Information Administration, Natural Gas Gross Withdrawals and Production, 2010 data. available at http://www.eia.gov/dnav/ng/ng__prod__sum__dcu__NUS__a.htm; U.S. Environmental Protection Agency, Inventory of U.S. Greenhouse Gas Emissions and Sinks (1990-2009) (Apr. 15, 2012). Net emissions of methane were just over 600 bcf (billions of standard cubic feet), while gross withdrawals were approximately 26,800 bcf; this implies a net leakage of approximately 2.3 percent

[5] Howarth, R. et al., Methane Emissions from Natural Gas Systems, Background Paper Prepared for the National Climate Assessment (reference number 2011-0003) (Feb. 25, 2012), available at http://www.eeb.cornell.edu/howarth/Howarth%20et%20al.%20--%20National%20Climate%20Assessment.pdf.

and gas sector, required by Congress in 2008[6]. The reporting rule data confirms that methane leakage is significant and provides additional insight into sources of leakage. However, the reporting requirements omit a number of methane sources within the industry, and so the data does not provide a complete picture of total methane emissions from the sector. As such, much more accurate and verified data is needed to ascertain the true extent of methane emissions from the oil and gas sector. NRDC is encouraged that more studies are beginning to be conducted to address this important issue.[7]

Regardless of exactly how much methane is being leaked, it is imperative to reduce methane emissions to the greatest extent possible, to a sector leakage rate of well below 1 percent. Fortunately, according to our report last year,[8] NRDC found that 10 tried and tested, cost-effective technologies exist today that could control up to about 80 percent of these emissions. Some of these are: a) technologies to control emissions soon after a well is fracked, as well as while the well is operating; b) better seals for compressors; c) gas flow controllers with reduced leakage; and d) better leak detection and repair programs. (Importantly, these same technologies would help control toxic air pollutants that are known to cause serious health issues.)

The technologies described in NRDC's report are cost-effective. Most require a modest upfront investment. But in most cases these investments would pay for themselves in less than two years, while some investments could take a little longer. This is because these technologies reduce the leakage of methane, which after being retained or captured can be sold as fuel or used onsite. However, these technologies are not currently being used widely enough by industry.

A number of these controls are required for some sources under EPA's recently updated new source performance standards to control volatile organic compounds, or VOCs, which are co-emitted with methane.[9] But due to their incomplete coverage, the standards fail to reach the vast majority of methane emissions from the sector. Thus, more can and needs to be done. Methane pollution should be addressed directly, instead of as a co-benefit of other pollution standards, which will more effectively control methane leakage by reaching methane sources not covered by the VOC standards. More importantly, existing sources of methane leakage should be addressed, as they contribute to the bulk of methane leakage from the industry. The Clean Air Act confers EPA with the authority and obligation to undertake these activities.

Accordingly, we need stronger standards from the EPA to ensure that methane emissions from the oil and gas industry are significantly reduced, using technologies that are viable and cost-effective. This can be done by EPA at the national level, and the agency has legal tools available to address region-specific circumstances in conjunction with the states.

RESPONSE OF FRANCES BEINECKE TO QUESTIONS FROM SENATOR ALEXANDER

Question 1. Given the advantage of low domestic natural gas prices that resulted from increased production from unconventional natural gas reserves, do we really have a problem since we might only export 10 percent of our natural gas?

Question 2. At what percentage of exports, compared with the overall U.S. production of natural gas, does the U.S. lose its price advantage of natural gas that we have today?

Question 3. What are your projections for the amount of natural gas the U.S. will be producing in 10 years?

Question 4. Under present policies, if you had to make a guess, what would be the range of the percentage of U.S. natural gas production that we would be exporting in 10 years?

Answer. NRDC does not have a position on LNG exports and has not yet engaged in analysis on these issues.

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[6] U.S. Environmental Protection Agency, Greenhouse Gas Reporting Program, 2011 Data, available at http://epa.gov/ghgreporting/ghgdata/reported/index.html.

[7] Environmental Defense Fund, New Study To Provide Important, Direct Measurement Data On Methane Emissions From Natural Gas Production (2012), available at http://blogs.edf.org/energyexchange/2012/10/10/new-study-to-provide-important-new-direct-measurement-data-on-methane-emissions-from-natural-gas-production/.

[8] NRDC, Leaking Profits: The U.S. Oil and Gas Industry Can Reduce Pollution, Conserve Resources, and Make Money by Preventing Methane Waste (Mar. 2012), available at http://www.nrdc.org/energy/leaking-profits.asp

[9] U.S. Environmental Protection Agency, Federal Register Vol. 77, No. 159, Oil and Natural Gas Sector: New Source Performance Standards and National Emission Standards for Hazardous Air Pollutants Reviews (Aug. 16, 2012), available at https://www.federalregister.gov/articles/2012/08/16/2012-16806/oil-and-natural-gas-sector-new-source-performance-standards-and-national-emission-standards-for.

Right now, NRDC's shale oil and gas work is focused on the environmental, health and community impacts of the fracking production process. However and wherever shale has is used, protecting against the environmental and health impacts of production is critically important.

Specifically, we've been working aggressively to advance stringent and protective safeguards at the local, state and national level. And in addition to our regulatory efforts, we recently launched NRDC's Community Defense Project, a major new initiative to help local communities protect and defend themselves against the risks presented by fracking through the courts and the halls of state capitols.

Additionally, we are devoted to advancing policies to promote the development of real clean energy sources, like energy efficiency and renewable power sources, like wind and solar, as quickly as possible.

NRDC did submit comments to DOE on the specific issue of a study that DOE commissioned on the price and economic impacts in the United States of LNG exports. We pointed out some flaws in the study that tended to underestimate the price impact of LNG exports and also critiqued the study for failing to take into account the economic impacts (social costs) of carbon pollution. Finally, we urged DOE to look at the potential economic and environmental impacts of LNG exports in other countries, including China and India, which are heavily dependent on coal.

RESPONSES OF KENNETH B. MEDLOCK TO QUESTIONS FROM SENATOR MURKOWSKI

Question 1. Dow has expressed concern about the ability of the natural gas supply in the U.S. to meet potential increases in domestic demand, particularly from the manufacturing, power and transportation sectors. Do you have a response to this concern?

Answer. The concern seems to be actually one of how price will respond to demand growth from many sectors. First, the price impact of demand growth in multiple sectors is ultimately dependent upon the elasticity of supply. If supply can expand significantly as price rises (meaning it is very elastic—such as in Case 1 in Figure SM.1*), then the capabilities of the upstream sector are more than adequate to meet demands from multiple sectors. Figure SM.1 indicates the effect of different supply capabilities in response to a particular demand increase due to exports. Research done at the Baker Institute indicates that domestic supply is highly elastic, which would suggest that price will not rise substantially as demand grows.

Second, the opportunity for demand growth in each of the aforementioned sectors is a function of the domestic price of gas. If the price of gas begins to rise, then the opportunities for demand growth are mitigated, although not at the same pace in each sector. For example, as gas prices rise, the opportunity for natural gas into transportation is likely reduced first. Then, certain sectors in manufacturing will be affected, followed by power generation. Importantly, the rank order is not independent from policy. For example, as EPA actions aimed at reducing certain pollutants become binding, coal-fired power generation will be displaced in favor of natural gas, largely due to the already large installed natural gas generation capacity in the US. So, gas demand in power is likely to be the most responsive margin along which demand growth occurs in the US.

Industrial sector opportunities will persist as long as the price of natural gas in the US is lower relative to price in other regions. This is a very important point because low price in the US is but one necessary condition—it is not sufficient. In fact, in the late 1990s domestic gas price scarcely increases and was averaging in the mid $2/mcf range, but domestic industrial gas demand was declining due to efficiency improvement and certain activities moving offshore to cheaper supplies (places such as Trinidad). So, the price abroad is also an important factor when determining industrial demand opportunities domestically. Indeed, if domestic demand rises to the point that domestic price also rises, then some of the presupposed industrial demand may not actually materialize because the opportunities for expansion will be deemed greater elsewhere.

Policy makers must ultimately grapple with (i) whether or not intervention is warranted and (ii) if so, what can (and perhaps even should) be done to limit the increases in demand for US-produced natural gas. For example, if there is a policy orientation to seeing the industrial sector expand, then the EPA rule-makings that stand to promote the expansion of gas demand in power generation must ultimately be challenged. More generally, if the concerns are that expanded demand will compromise the opportunity for industrial activity, then one could argue government should take steps to limit demand growth on multiple fronts—power generation de-

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* All figures have been retained in committee files.

mands, transportation demand, and exports. This seems ill-advised when prices are allowed to serve a rationing function that will ensure the greatest overall economic benefit—for example, when price discovery occurs in a transparent marketplace driven by supply-demand fundamentals.

However, if domestic supply is indeed highly elastic, as Baker Institute research indicates, then the concerns are inconsequential. In effect, there is room for growth from multiple sectors because supply is adequate.

Question 2. The debate about LNG exports has included arguments for action by the government to limit the volume of LNG exports to ensure the domestic price of natural gas remains low. When the U.S. has imposed price controls in the past, this has resulted in gas shortages. What would be the impacts to the natural gas industry and U.S. economy from efforts by the government today to restrict the level of exports?

Answer. Restrictions on export volumes, or any restrictions for that matter, create market distortions. Constraining the margins of demand response can have undesirable consequences because it effectively subsidizes certain sectors at the expense of others. More specifically, rents accrue to the consumers who are not constrained, largely because revenue earning opportunities are diverted from other sectors. This is distortionary by definition. Accordingly, the overall welfare effect of such a policy is generally negative.

Importantly, it is not likely that shortages such as those in the 1970s would emerge, because the proposed policy is not one of direct price control. It is indirect via quantity controls. The domestic price, under a policy of export restrictions, would still equilibrate supply and demand, so the central tendency should still reflect long run marginal cost. The quantity control would result in lower domestic production, but the result would be driven by lower demand.

Question 3. During the hearing before this committee, there was testimony that natural gas prices index to oil prices worldwide and concern expressed that this will lead to higher gas prices in the U.S. if LNG exports to non-FTA countries are approved. Do you have a response to this concern?

Answer. This is simply not true. To begin, oil indexation of natural gas occurs in a contract-specific manner. So, an individual buyer might be willing to contract a certain proportion of their supply using oil-indexed terms. This only occurs if the buyer has concerns about the ability to procure supply, which is indicative of a lack of liquidity. Historically, this has been true in Asian and European markets due to high fixed costs of entry. However, the oil-indexed paradigm has already been significantly altered in Europe following the opening of several hubs on the continent and expansion of various supply options. In Asia, the market is changing much more sluggishly, but buyers in the Asian market are already arguing for gas-indexed purchase agreements, a development triggered by supply growth not only in the US, but also Australia, East Africa, the Middle East, and Russia.

In fact, in the last 10 years the spot (or short term) market in both Asia and Europe has grown substantially. In Europe, spot and short term sales have jumped from less than 10 percent of total LNG sales in 2000 to almost 25 percent of total LNG sales in 2011, and the pipeline market is witnessing a similar evolution. In Asia, the trend is similar, with spot and short term sales increasing from around 2 percent of total LNG sales in 2000 to just over 20 percent of total LNG sales in 2011 (see *Figures SM.2 and SM.3). In addition, the contracts in place to consumers in each market are not dictating flow. In fact, Figures SM.2 and SM.3 together indicate significant diversion from the Atlantic to Pacific basin as total trade in the Atlantic basin falls well short of contracted volume in 2011 but the opposite is true in the Pacific basin.

Importantly, the spot price in Europe is below the typical oil-indexed price, as was the spot price in Asia until the disaster at Fukushima, which led to an unexpected demand shock that drove a classic basis blowout in the Asian price (see *Figure SM.4—Asian price is JKM, European price is NBP, and US price is Henry Hub). As nuclear capacity comes back online in Japan, the spot price in Asia will decline back to its "normal" relationship with NBP. Growth in spot market trade is expected to continue, so the price in any exporting region will at most be the spot price in the importing region minus the cost of liquefaction and transportation. Thus, if the long run price of gas in Asia is $10/mcf, then the price in the US should be approximately $4.50-$5/mcf, which is still significantly lower than oil-parity. This simply means is that a basis differential should persist due to transport costs. This is even true across the pipeline network in the most liquid natural gas market in the world—North America.

RESPONSE OF KENNETH B. MEDLOCK TO QUESTION FROM SENATOR BARRASSO

Question 1. In your opening statement, you mentioned that the three countries "most heavily impacted" by the increase in natural gas production in North America would be Russia, Iran, and Venezuela.

a. Would you please explain how liquefied natural gas (LNG) exports from the United States would impact each of these nations (and their state-owned enterprises), respectively?

b. Would you please explain how LNG exports from the United States would promote U.S. national security interests and the energy security of key U.S. allies such as NATO member nations and Japan?

Answer. To begin, the statement was made in reference to a study we performed for the Department of Energy Office of International Policy and Affairs. In that study (attached as an addendum), we simulated a world with known shale resources and compared it to a world without any shale. The second case was meant to capture the outcome that most anticipated would occur in the early 2000s, when large investments were being made to import natural gas to the US. A key result of that work was that Russia, Iran and Venezuela were the three countries most disadvantaged by the emergence of shale in the United States. So, the dramatic change in North American gas market has already had a significant ripple effect throughout the global gas market. Importantly, this result is one very important reason why this question has to be considered in an international trade context, as pointed out in "US LNG Exports: Truth and Consequence" (also attached as an addendum).

LNG exports from the US—were they to occur—would likely extend those impacts. This follows from the fact that US LNG exports would be directed at markets in Asia, and potentially Europe. Asian demands, should they continue to grow, will naturally pull on resources in Russia and the Middle East, as well as Southeast Asia, Africa and Australia. In fact, Russia is a natural partner for pipeline trade with Asia—barring of course any geopolitical constraints—and the Middle East is a natural waterborne trade partner with Asian consumers—as witnessed by trade in multiple commodities. To the extent that US supplies are sold to Asian consumers, then, all else equal, this would displace supplies from other locations. This would reduce dependence of Asian consumers, and the world for that matter, on supplies from Russia and the Middle East. Since Iranian reserves are among the world's largest, Iran is impacted directly. Importantly, much of this is an impact that is most likely immaterial in the near term, but longer term could be substantial. However, expectations about future market conditions are very much governed by actions today, and, in turn, those expectations drive future investment decisions and hence are influential to future outcomes.

LNG exports will not likely have any real impact in the short to medium term on Venezuela. It is not currently a significant player in global natural gas markets, and the political and economic fate of the nation—and the resultant impacts on PDVSA for that matter—are highly uncertain in the wake of the passing of Hugo Chavez. The only thing that can be said is that global demands for Venezuelan natural gas are generally abated with US LNG exports. But there could emerge regional trading partners—such as Chile, Argentina, Brazil, and Colombia—that enjoy a distinct transportation cost advantage to the US due their proximity to Venezuela. But, even that is an uncertain stipulation as gas resources exist in many of those countries as well, although political pressures hinder development.

The effects on NOCs such as Gazprom and INOC are different and to an extent uncertain largely due to the response pathways available to each. In the case of Gazprom, domestic prices are highly subsidized in Russia, and domestic sales account for almost 70 percent of Russian volumes. So, export revenues have historically been a critical source of revenue for the government and for field development. To the extent export revenues are compromised, one option available is to phase out domestic subsidies. This has, in fact, been discussed for different classes of consumers—i.e.-industrial, commercial, residential, power generators. It is not a politically palatable solution, as industrial users in Russia argue decreased competitiveness, and residential and commercial users argue a right to Russia's national wealth. Nevertheless, a decrease in the subsidy levels would compensate for lost revenues if exports are lower. Of course, if Russia cannot accomplish a reduction in subsidies and it loses export markets, it runs the risk of beginning to look like Mexico—a nation with resource wealth that it cannot tap and, as a result, years of slowly declining production.

In the case of INOC, a significant portion of current gas production is used for enhanced oil recovery and the rest is sold domestically at prices well below international market parity. This has led to domestic gas shortages that have pushed

up imports from Turkmenistan, an almost inconceivable outcome given Iran's resource wealth. But, this is an oft repeated unintended consequence of artificial price setting. If Iran could export, it would likely do so via pipeline to Pakistan and India and LNG to other Asian buyers. This would provide valuable revenue uplift associated with gas production that could be used to enhance Iran's position in global gas markets through further development and bolster the government's budget. So, by delaying the need for Iranian resources, the only real market for Iranian natural gas is domestic, and unwinding subsidies is a tenable and highly unlikely proposition, meaning Iranian natural gas is effectively a stranded resource in terms of its global impacts. It also denies Iran a potentially important revenue stream.

Any US national security interests and energy security benefits bestowed to US allies follow directly from the above. By reducing dependence on trading partners in volatile regions of the world and/or trading partners who have demonstrated a willingness to manipulate supply to gain a political advantage, any concerns about security of supply are mitigated. Thus, it follows that more direct trade with a stable trading partner where market forces are instrumental in determining supply-demand balance will enhance security of supply. This is, in fact, among the reasons that some Asian buyers are seeking to add US LNG supplies to their portfolios.

Another important reasons Asian buyers seek trade with the US is the desirability of a gas price indexed purchase rather than a price indexed to oil for contracted flows. In fact, as the US enters the global LNG market, liquidity will be enhanced. This is a very important point that ties directly back to the impacts of US LNG exports on NOCs and the gas market more generally. Oil indexation of gas sales is still prevalent, particularly in Asia, as it provides a means of ensuring delivery of supplies where there is no ability to buy at a hub or on an exchange, and it follows from a lack of market liquidity. As liquidity grows, the desirability of this paradigm wanes. In fact, short term and spot sales of LNG have increased from around 5 percent of the global LNG market in 2000 to over 20 percent in 2011. This is indicative of the ongoing paradigm shift. Adding US LNG to the supply portfolio enhances liquidity by adding a supply option as well as a direct link to a liquid gas market, which will further erode the traditional LNG contract paradigm. This will have direct implications for revenues for all gas exporters, even those with existing contracts as LNG contracts typically have re-openers (or price renegotiation clauses) that can be triggered when markets shift in particular ways. So, the liquidity effects of US LNG exports could indeed be significant and transformative of the way LNG is traded globally. Note this could happen even if export capacity is added but very little gas is actually exported.

RESPONSES OF KENNETH B. MEDLOCK TO QUESTIONS FROM SENATOR ALEXANDER

Question 1. Given the advantage of low domestic natural gas prices that resulted from increased production from unconventional natural gas reserves, do we really have a problem since we might only export 10 percent of our natural gas?

Answer. The answer depends entirely on how responsive domestic supply is to price. The price impact of LNG exports, or any increase in demand for that matter, is ultimately dependent upon the elasticity of supply. Consider *Figure SA.1, which indicates the effect of different supply capabilities in response to a particular demand increase due to exports. If supply can expand significantly as price rises (meaning it is very elastic—such as in Case 1 in Figure SA.1), then domestic supply capabilities are more than adequate to meet such demand growth. However, if one takes the view that supply is relatively unresponsive to price, as in Case 2 in Figure SA.1, then the price impacts could be significant for even small volumes of LNG exports. This would have adverse effects on all sources of demand and would ultimately serve to limit demand growth in all sectors as well as limit LNG exports.

Research done at the Baker Institute indicates that domestic supply is highly elastic, as in Case 1, which would suggest that price will not rise substantially as demand grows. So, this indicates that LNG exports will not have a significant price impact domestically.

It is important to also note that an assumption about volume must be made in the context of a fully responsive international trade paradigm. In other words, export volumes are not simply given volumes. They are arrived at through the equilibration of demand and supply around price. Trade affects price in both exporting and importing markets. This point is highlighted in "US LNG Exports: Truth and Consequence" which is attached for your reference.

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*All SA figures have been retained in committee files.

Question 2. At what percentage of exports, compared with the overall U.S. production of natural gas, does the U.S. lose its price advantage of natural gas that we have today?

Answer. There is no such volume. If the price advantage is completely eroded than exports will fall until a price differential exists that supports the cost of the trade. In fact, the price in an exporting region will always be lower than the price in the importing region. If it is not, then trade will cease. See *Figure SA.2 for an illustration of equilibrium in an international trade context.

Importantly, this is not simply an academic exercise. It is proven time and again in multiple markets where trade between regions exists. Only when the cost of the trade (**t** in Figure SA.2) is diminishingly small do we see price convergence in an absolute sense between trading partners. For natural gas, the full cost of the estimated trade from the US Gulf Coast to Japan is about $5/mcf, meaning the price differential between the two markets should gravitate toward that value. Even if one removes the fixed cost of infrastructure from the calculation, the differential still persists at over $2/mcf. So, if trade is occurring, a differential will exist, and as long as the US is the exporting country, the price in the US will be lower.

During the testimony, it was claimed that the price to a consumer in Australia is at parity with the price of LNG delivered to Japan. Apparently, this was done to support the notion that the domestic price for the exporter will rise to parity with the price paid by the importer. This comparison is not apples-to-apples. The LNG price is an ex-ship price, whereas the price to a consumer in Australia reflects the cost of local distribution, taxes, fees and other costs. Even in the US in 2012, when the price at Henry Hub averaged $2.76/mcf, the national average price of gas delivered to the city gate, where the local distribution company (LDC) takes possession of the gas, was $4.73. Then, the LDC must account for its fees and costs thus resulting in a national average price delivered to residential users of $10.68/mcf and commercial users of $8.13/mcf. To make matters more complicated, the fees and costs vary widely by LDC, so some US consumers pay much more than indicated by the national average, such as in Massachusetts where the average price to a residential consumer in 2012 was $13.42/mcf. Even industrial and power generation users of gas who are not LDC customers pay more than Henry Hub as they must pay to ship gas along the interstate pipelines.

In 2012, the spot price of delivered LNG was $15.09/mcf in Japan and $9.48/mcf in the UK. But, comparing these wholesale spot prices to delivered end-user prices is completely inappropriate when evaluating the effects of trade. Moreover, the East Australian (or Sydney) market is not connected to West Australia, which is where Australia's LNG exports originate. Prices in East Australia are set entirely by East Australian supply-demand factors having nothing to do with exports from the Australian Northwest shelf to Japan. Moreover, the wholesale price of gas in West Australia is well below the current price of LNG delivered to Japan.

As one final point, it is important to note that US competitive advantage can be compromised if other countries, who may also export but need not, heavily subsidize prices to industrial users. This tilts the scale, but also creates an unsustainable situation, as has been witnessed many times over—Indonesia, Argentina, Iran, etc. Notably, the advantage is not about absolute price, it is about relative price. Even if the price in the US averages $2.50/mcf, industrial users will offshore if the price abroad is lower. This, in fact, happened in the late 1990s in the US.

Question 3. What are your projections for the amount of natural gas the U.S. will be producing in 10 years?

Answer. The work done at the Baker Institute under the Center for Energy Studies indicates the US marketed production volumes will be about 8 percent higher than currently. Importantly, this volume is projected to primarily be used to meet domestic demands, as the prediction for export volume by then is just under 2 bcf/d, which is less than 3 percent of current marketed production. The above referenced paper "US LNG Exports: Truth and Consequence" highlights the primary drivers of this result. Namely, international market responses to current high prices will serve to ultimately lower them—i.e.-the best cure for high prices is high prices.

Question 4. Under present policies, if you had to make a guess, what would be the range of the percentage of U.S. natural gas production that we would be exporting in 10 years?

Answer. We have done various scenarios to assess the market potential for US LNG exports. We consistently see a range of between 0.5 bcf/d and 3.5 bcf/d, which equates to a range of between less than one percent to about five percent. In order to drive export volumes to the high end, we must make very strong assumptions about the long term supply responsiveness of Russia, China (due to shale resources), and Qatar.

APPENDIX II

Additional Material Submitted for the Record

STATEMENT OF THE AMERICAN PUBLIC GAS ASSOCIATION

On behalf of the American Public Gas Association (APGA), thank you for the opportunity to submit testimony on the Senate Committee on Energy and Natural Resources hearing titled, "Opportunities and Challenges for Natural Gas." APGA believes that the Committee should consider two issues critical for U.S. consumers of natural gas, which are reform of Section 5 of the Natural Gas Act (NGA) and the export of domestically produced natural gas in the form of liquefied natural gas (LNG). We sincerely appreciate the opportunity to present our views and stand ready to work with the Committee on these and any other natural gas issues that may be considered.

APGA is the national association for publicly-owned natural gas distribution systems. There are approximately 1,000 public gas systems located in 36 states. Publicly-owned gas systems are not-for-profit, retail distribution entities owned by, and accountable to, the citizens they serve. They include municipal gas distribution systems, public utility districts, county districts, and other public agencies that have natural gas distribution facilities.

ISSUE 1—REFORM OF SECTION 5 OF THE NATURAL GAS ACT

Background

In 1938, Congress gave the Federal Power Commission (now the Federal Energy Regulatory Commission (FERC)) authority under the NGA to regulate transportation rates charged by interstate natural gas transmission pipelines. The NGA mandates that customers of interstate pipelines are to be charged "just and reasonable" rates, mirroring the core rate sections of the Federal Power Act (FPA), which mandate just and reasonable rates for electric utilities.

Periodically, Congress has updated both the FPA and the NGA as the electric and natural gas industries have evolved. Significantly for these purposes, Congress amended the FPA in 1988 and again in 2005 allowing FERC to provide refunds to the extent customers were charged unjust and unreasonable rates as found by FERC; with such refunds to be effective as of the refund-effective date, which may be set by FERC as early as the date that a complaint is filed under FPA Section 206. Unfortunately, no such amendments were made to the NGA.

Until 1992, interstate pipeline companies were required to have their rates evaluated every three years by the FERC to ensure that they were just and reasonable, so the need for such reform was not as pressing.

However, in 1992, FERC issued Order 636 as part of the transition to unbundled open access transportation and ended the three-year rate review process. The practical result of this has been that pipelines with increasing costs file for and receive rate increases under NGA Section 4; while pipelines with decreasing costs, ,whose rates have long since ceased to be just and reasonable, simply continue charging consumers excessive rates, often for very extended periods of time, sometimes 10 or more years.

Even if customers or the FERC initiates an NGA Section 5 complaint case against an interstate pipeline company, and the FERC agrees that the just and reasonable standard was violated, the FERC can only change the company's rates prospectively from and after the date of the FERC final order, with no refunds to affected consumers during the often lengthy period required to process such a complaint case. It goes almost without saying that unless pipelines can settle such cases on terms very favorable to themselves, as is usually the case, they have every incentive and the resources to drag out the litigation of the complaint case for years since there are no refund repercussions at the end of the proceeding. This lack of parity between the complaint sections of the NGA and FPA leaves natural gas customers

ranging from homeowners to industrial enterprises exposed to overcharges for extended periods in violation of the NGA's just and reasonable standard. This lack of protection has resulted in millions of customers paying excessive, unjust and unreasonable rates for natural gas transportation, affecting families' bottom lines and businesses' ability to compete and create jobs.

Recent Developments

Since November 2009, FERC has initiated approximately three Section 5 cases each year. Whether or not Section 5 cases are initiated at all is at the discretion of the Commissioners—there is no statutory requirement that FERC do so. APGA believes that the recent FERC Section 5 actions are important for a number of reasons. First, the Commission to its credit is taking the initiative to review pipeline Form 2 filings (annual filings containing pipeline financial data) and calling out the most egregious over-earners, most of which have not been before the Commission in many years for a rate review. The Form 2 data shows that these entities are often earning returns in excess of 20 percent, which, all seem to concede, is exorbitant for a regulated monopoly.[1]

The second point that these cases illustrate is the futility of bringing such complaint cases if the goal is to achieve just and reasonable rates under the NGA. The pipelines are able to use delay tactics and threats of time-consuming NGA Section 4 filings to bully both the customers into settling the cases on terms very favorable to the pipelines and the commission into approving these unbalanced settlements. These points have been made by the various parties to these cases[2] and fully recognized by the commissioners themselves. For example, in one of the first complaint cases initiated by the commission, involving Northern Natural Gas Company, Docket No. RP10-148, Commissioner LaFleur observed as follows in a concurring statement:

I Irecognize the concerns raised by the Industrials on rehearing regarding the unfair advantage pipelines may have in a section 5 proceeding vis-a-vis their customers. The Commission can only act, however, within the existing statutory scheme. I believe that this proceeding clearly demonstrates the need for reform of section 5 of the NGA to prevent the asymmetry of leverage between applicants under section 4 and complainants or the Commission under section 5. As happened here, without Commission authority to set a refund effective date upon institution of a complaint or investigation under section 5, a pipeline can threaten to file a general section 4 rate case and move those rates into effect prior to the date by which a Commission order in the section 5 proceeding could lower those rates. This situation places the parties supporting the section 5 proceeding in a difficult situation in that they may be forced to pay even higher rates without refund relief for some period of time. It also hampers the Commission's efforts to ensure just and reasonable rates. I therefore support legislative action to amend the NGA to provide the Commission with refund authority in section 5, similar to that provided under section 206 of the Federal Power Act.[3] "

Similarly, in a dissenting statement in that same case Chairman Wellinghoff stated:

"As a general matter, the lack of refund authority under section 5 of the NGA allows the regulated community to defeat the purpose of section 5 at least in some circumstances. This is not the case under the Federal Power Act (FPA). The Commission must establish a refund effective date for a section 206 proceeding and has the authority to order refunds for the period ending 15 months after the refund effective date. Thus, the incentive for game-playing is removed and the Commission can determine on the merits that a public utility's rates are just and reasonable. For this reason, I support legislative changes providing for NGA refund authority paralleling that provided to the Commission in the FPA.[4] "

In fact, all of the sitting commissioners including (newly appointed Commissioner Clark has expressed his support for Section 5 reform in a meeting with APGA),

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[1] The annual report of the Natural Gas Supply Association, "Pipeline Cost Recovery Report: 32 Major Pipelines 2006–2010," shows that the twelve companies called on the carpet are but a small fraction of the total number of over-earners (see Report at pp. 4–5).

[2] Natural Gas Pipeline Co. of America, RP10-147, comments of PGC et al at 1-3, comments of Missouri Public Service Commission at 3-6; comments of APGA at 1-3; comments of Pennsylvania Public Utility Commission at 1; and in Northern Natural Gas Co., RP10-148, comments of Northern Municipal Distributors Group et al at 2-3, 5-6; comments of Michigan Public Service Commission at 1-2; response of APGA at 1-4.

[3] Comm'r LaFleur concurring statement (p. 2) in Northern Natural Gas Co., RP10-148, Oct. 29, 2010

[4] Chairman Wellinghoff dissenting statement (p. 4) in Northern Natural Gas Co., RP10-148, Nov. 2 , 2010

being fully familiar with the outcomes in these Section 5 proceedings, have stated their support for amendment of NGA Section 5 to provide refund authority comparable to that available under FPA Section 206.

The prospect of continuing to pay excessive rates for natural gas transportation has brought together a diverse group of stakeholders that is growing. Groups that have supported reform include: the Industrial Energy Consumers of America; American Iron and Steel Institute; American Forest and Paper Association; American Public Power Association; National Farmers Union; Public Citizen; and, most recently, the National League of Cities, which represents 19,000 cities, villages, and towns. This growing coalition of organizations recognizes that the only way to protect individual consumers as well as the competitiveness of major industrial users of natural gas is to reform Section 5 of the NGA. As significant as the number and type of entities supporting reform is the absence of entities opposing reform. To date, only pipelines and their trade association have opposed the efforts to amend NGA Section 5 to afford consumers meaningful protection against rate overcharges.

The arguments for reform are straight-forward and persuasive. First and foremost is the NGA mandate that pipelines charge just and reasonable rates and that customers be protected from paying unjust and unreasonable rates for natural gas transportation. The fact that overcharges are an ongoing problem is illustrated both by the pipeline's own (Form 2) data cited in the Section 5 complaints initiated by the commission and by the data released each year by the Natural Gas Supply Association (NGSA). In 2012, NGSA released a study of the 32 largest interstate pipelines (representing 80 percent of the transmission market), which found that these companies overcharged customers by $4.2 billion from 2006-2010 (this is an increase of $100 million compared to the 2011 report).[5] The study also used Form 2 data submitted by interstate pipeline companies and assumed an average return on equity (ROE) of 12 percent to be acceptable.[6] Over the five year period, several companies averaged an ROE above 20 percent and one above 42 percent.[7]

Overcharging for natural gas transportation does not simply mean fewer dollars available for businesses and consumers, but also means fewer jobs in an economy where job growth is more critical than ever. Major industrial enterprises spend millions of dollars on natural gas, which constitutes a major input cost. The fact that many of these enterprises are paying excessive rates for natural gas transportation limits their ability to create new jobs in the midst of strong competition from companies around the world. The money spent on excessive natural gas rates could be better spent by creating new jobs here in the U.S. and taking advantage of our nation's vast, newly accessible shale gas reserves.[8]

Addressing Pipeline Arguments Against Reform

The benefits to businesses and consumers of reforming Section 5 of the NGA to limit pipelines to rates that are just and reasonable are clear and compelling: lower costs and greater domestic job creation. However, to date, interstate pipelines continue to resist reform since it affects their bottom line, so it is important to address each of their arguments to determine their merit or lack thereof.

Interstate pipeline companies' arguments against reform may be summarized as follows: FERC-established rates remain just and reasonable until changed; ordering refunds would constitute "retroactive ratemaking"; providing for refunds would undermine infrastructure development; and reform is unnecessary because transportation rates themselves are a relatively small component of the total bundled cost of natural gas to consumers. Each of those points will be addressed below.

The pipelines argue that since the rates being charged by a pipeline at any given point in time were previously approved by the FERC, they must still be just and reasonable, and thus refunds should be denied. This contention is self-evidently inaccurate since a rate that is just and reasonable at any given point in time may become unjust and unreasonable at a subsequent point in time if costs materially increase or decrease. Pipelines are not bashful about filing to increase their rates when costs are rising, and such rate increases go into effect virtually immediately subject to refund after a nominal suspension period under NGA Section 4. The suggestion that pipelines should be allowed to supersede previous rates determined to be just and reasonable after a nominal suspension period but that consumers should

[5] Natural Gas Supply Association, "Pipeline Cost Recovery Report: 32 Pipelines 2006-2010" pgs 4-5.

[6] Of course, in today's financial markets, the assumed 12% ROE is several hundred basis points above what could be justified.

[7] Natural Gas Supply Association, "Pipeline Cost Recovery Report: 32 Pipelines 2006-2010", p. 5

[8] Energy Information Administration "Annual Energy Outlook 2012 Early Release," pgs: 1 and 5.

have to wait potentially years before getting relief from unjust and unreasonable rates is absurd on its face. This argument was obviously found wanting in 1988 when Congress amended FPA Section 206 to provide for refunds where rates were ultimately determined to be excessive.

Interstate pipelines also argue that reform of Section 5 to provide refund protection for consumers is tantamount to "retroactive ratemaking." This statement is legally inaccurate and is designed to conjure fears amongst policymakers of overzealous regulators intrusively altering pipeline rates, creating uncertainty and harming pipelines' business. In reality, if a customer files a complaint under a reformed Section 5, the Commission, if it believes that the complainant has shown good cause to set the matter down for hearing, will set a refund-effective date, which date may not precede the date the complaint is filed. Hence, all refunds are prospective from the refund-effective date, and there will be no refunds unless the Commission at the end of the proceeding determines that the pipelines' rates are excessive under the "just and reasonable" standard. In short, unless FERC determines that interstate pipelines are violating the NGA, no refunds will be required. The identical provision under the FPA has been upheld against charges of retroactive ratemaking.

The interstate pipeline companies also argue that reforming Section 5 will harm their ability to build infrastructure. This argument is a red-herring and is misleading in at least five different ways:

First, new infrastructure projects are certificated to earn healthy equity returns, usually in the 12 percent range. NGA Section 5 reform does not affect by one iota the ability of these projects to earn such returns; rather, NGA Section 5 reform is only applicable to those egregious over-earners whose customers are underwriting returns far in excess of the allowed returns.

Second, almost all significant new infrastructure projects are undertaken on the basis of "negotiated" contracts between the transporter and the shippers. Negotiated contracts are not subject to rate changes by the transporter under NGA Section 4 or rate challenges by shippers under NGA Section 5; the rate is fixed for the term through bilateral negotiations. These negotiated contracts form the basis for the project developer to go to the marketplace and provide the developer with known returns for the contract terms. Thus, the argument that NGA Section 5 reform would deter new infrastructure development is false and misleading.

Third, the FERC is required by law in setting rates to provide for a rate of return that permits the affected pipeline to recover all debt costs plus raise capital in the marketplace at reasonable rates. FERC has done just that, and the financial markets understand this, so NGA Section 5 reform will not affect at all the ability of interstate pipelines to raise capital in the marketplace.

Fourth, the FERC itself, which is pro-business and pro-infrastructure, understands that the argument that Section 5 reform would be bad for infrastructure development and thus bad for job development is rash, for all of the reasons noted above, which explains why all sitting commissioners, including the Chairman and prior two Chairmen, support NGA Section 5 reform. Commissioner Clark has also expressed his support in a private meeting with APGA.

Fifth, many of the leading builders of infrastructure are not the more egregious over-earners, and they have successfully gone to the marketplace for billions of dollars for new infrastructure construction. For example, El Paso Natural Gas Company touts on their website that in 2010 they invested $318 million in new infrastructure projects.[9] According to the NGSA study, El Paso had an ROE of 8.3 percent for 2010 and a five year average ROE of 10.7 percent.[10] In other words, there is no correlation between over-earning pipelines and infrastructure construction.

In brief, this "infrastructure" argument is nothing but a strawman raised by the pipelines because they have no defense on the merits against Section 5 reform—they are overcharging customers because the rates of many of them are no longer just and reasonable. Absent NGA Section 5 reform, FERC, which is supposed to ensure that pipelines charge and consumers pay just and reasonable rates, is basically helpless to prevent allowing pipelines to defeat the purpose of the NGA.

Finally, the interstate pipelines also argue that transportation rates for natural gas are a small part of the overall cost to consumers, so policymakers should ignore it. First, this contention tries to obscure the fact that excessive rates for transpor-

[9] El Paso Natural Gas Company website: http://investor.eppipelinepartners.com/phoenix.zhtml?c=215819&p=irol-newsArticle&ID=1532478&highlight=

[10] Natural Gas Supply Association, "Pipeline Cost Recovery Report: 32 Pipelines 2005-2009," pg. 5.

tation cost consumers and businesses some $4.2 billion over a five-year period[11]—money that should remain in the communities of the customers that are being overcharged. The fact of the matter is that the price of gas at the wellhead, which is the major component of the blended gas cost paid by consumers, is deregulated and thus that component is not at issue here. What is at issue is the FERC-regulated component: pipeline rates to move the gas from the field to local distribution companies and industrial loads and the issue that there is no basis for a regulated entity under the Natural Gas Act to over-recover its allowed return by hundreds of millions of dollars, as is the case today, simply because the production component of the ultimate charge paid by consumers is unregulated.

Conclusion

APGA believes that it is critical that businesses and individual consumers pay a fair price for natural gas and for its transportation. FERC is charged with ensuring this result, but in contrast to the situation under the FPA, it is handcuffed from carrying out its mandate by the same flaw in the NGA that handicapped the Commission under the FPA until Congress acted in 1988. As FERC Chairman Wellinghoff (and his predecessors) and all sitting FERC commissioners have observed publically and/or privately, no credible public policy reason exists to treat electric and natural gas customers differently in regard to ensuring that rates of jurisdictional companies are just and reasonable.

APGA thanks the Committee for its interest in this important issue and respectfully requests a hearing at the Senate Committee on Energy and Natural Resources so these issues can be debated in an open, on-the-record forum.

ISSUE 2—LNG EXPORT

The Department of Energy Office of Fossil Energy ("DOE/FE") commissioned two studies regarding the effects of LNG exports. The first, conducted by the U.S. Energy Information Administration ("EIA"), studied the impact of LNG exports on domestic prices and concluded that the exports will increase prices, with higher volumes causing more drastic increases.[12] The second, conducted by NERA Economic Consulting, focused on the macroeconomic effects of LNG exports, which it found would be a net positive while at the same time confirming that LNG exports would raise domestic natural gas prices, which would burden the U.S. consumers who can least afford the increase and disadvantage domestic manufacturing.[13] Policymakers must consider both of these studies and the many non-governmental studies, but also go beyond them to consider the profound tradeoffs entailed by exporting away an increasingly valuable U.S. fuel rather than supporting its use domestically.

Increased production of natural gas in the U.S. provides the nation with an unprecedented opportunity to pursue energy independence and sustained economic growth through a manufacturing renaissance grounded in plentiful, low cost natural gas. Price increases will also jeopardize the viability of natural gas as a "bridge-fuel" in the transition away from carbon-intensive and otherwise environmentally problematic coal-fired electric generation and inhibit efforts to foster natural gas as a major transportation fuel, which is important to wean the U.S. from its historic and high-risk dependence on foreign oil.

Background

To date, 22 applications have been submitted to DOE to export domestic LNG from the contiguous United States to Free Trade Agreement (FTA) or non-FTA nations based on the promise of huge unconventional domestic gas reserves. Many of those 22 applicants own or are affiliated with companies that own existing or previously planned LNG import terminals. Also to date, the total export capacity applied for is 29.41Bcf/d and 24.8 Bcf/d to FTA and non-FTA nations, respectively. Total marketed natural gas production was approximately 66 Bcf/d in the U.S. in

[11] Natural Gas Supply Association, "Pipeline Cost Recovery Report: 32 Major Pipelines 2006-2010," pgs 4-5.

[12] Effect of Increased Natural Gas Exports on Domestic Energy Markets, U.S. Energy Information Administration (Jan. 2012) ("EIA Export Report"). As requested by the DOE/FE, the EIA Export Report considered four scenarios: (1) 6 Bcf/d phased in at a rate of 1 Bcf/d per year (low/slow scenario); (2) 6 Bcf/d phased in at a rate of 3 Bcf/d per year (low/rapid scenario); (3) 12 Bcf/d phased in at a rate of 1 Bcf/d per year (high/slow scenario); and (4) 12 Bcf/d phased in at a rate of 3 Bcf/d per year (high/rapid scenario).

[13] Macroeconomic Impacts of LNG Exports from the United States, NERA Economic Consulting (Dec. 2012) ("NERA Study"). APGA understands (and applauds the fact) that the merits and demerits of the NERA Study will be assessed independently by DOE/FE in a separate proceeding (77 Fed. Reg. 73627); and hence APGA's comments here on the NERA Study are only preliminary and not intended to represent its complete assessment of the NERA Study.

2011; therefore, based on current marketed production data, the total applied-for export capacity would have the effect of increasing the demand for natural gas by nearly 48 percent.

Policymakers in Congress and at DOE have a duty to ensure that any application before it for export authority is not inconsistent with the public interest pursuant to NGA section 3(a).[14] The "public interest analysis of export applications" should be "focused on domestic need for natural gas," threats to domestic supply, and "other factors to the extent they are shown to be relevant."[15]

LNG Exports Will Increase Domestic Natural Gas Prices

According to the EIA Export Report, "[l]arger export levels lead to larger domestic price increases."[16] EIA also concluded that "rapid increases in export levels lead to large initial price increases," but that slower increases in export levels will "eventually produce higher average prices during the decade between 2025 and 2035."[17]

Even under the "low/slow" baseline scenario in the EIA Export Report, price impacts will peak at about 14 percent.[18] Under the low/rapid baseline scenario, EIA projects that wellhead prices will be approximately 18 percent higher in 2016 than they otherwise would be[19]. In fact, under all of the "low" scenarios accounting for different economic and shale reserve conditions, EIA predicts price impacts well above 10 percent that then moderate.[20] Under the "high/rapid scenario," EIA projects that prices will increase by 36 percent to 54 percent by 2018 depending on natural gas supplies and economic growth.

The NERA study also concluded that the higher the volume of LNG exports, the more domestic natural gas prices will rise. Both studies underestimate potential price increases because they are based on outdated projections of domestic demand for natural gas and the questionable assumption that the demand for natural gas is sufficiently elastic to prevent significant price spikes.

Domestic Demand Underestimated

On December 5, 2012, the EIA issued the Early Release of its Annual Energy Outlook for 2013 ("AEO2013"). The AEO2013 projects greater increases in domestic demand for natural gas than projected in prior Annual Energy Outlooks. In particular, the AEO2013 projects greater increases in demand for natural gas from domestic industry, particularly from the bulk chemicals and primary metals industries and as a result of "higher output in the manufacturing sector."[21] However, even AEO2013 appears to underestimate the coming growth in natural gas use for manufacturing, if domestic prices remain low.[22]

AEO2013 also projects greater increases in future reliance on natural gas for electric generation than projected by the EIA in previous Annual Energy Outlooks. The increased reliance on natural gas for electric generation is partially based on low natural gas prices, but also on implementation of the Environmental Protection Agency's (EPA) pending Mercury Air Toxic Standards ("MATS"), which will force the retirement of a number of coal-fired generators.

Both studies commissioned by DOE/FE rely on projected natural gas demand from AEO2011. These outdated projections fail to account for current EIA expectations regarding future demand and tend to overestimate demand elasticity, or the ability of natural gas consumers to curtail their purchases in response to higher prices in the electric generation sector. Once a coal plant is retired due to MATS, or for any

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[14] 15 U.S.C. § 717b(a).

[15] Sabine Pass Liquefaction, LLC, Opinion and Order Denying Request for Review Under Section 3(c) of the Natural Gas Act, October 21, 2010, FE Docket No. 10-111-LNG.

[16] Id. at 6. As requested by the DOE/FE, the EIA Export Report considered four scenarios: (1) 6 Bcf/d phased in at a rate of 1 Bcf/d per year (low/slow scenario); (2) 6 Bcf/d phased in at a rate of 3 Bcf/d per year (low/rapid scenario); (3) 12 Bcf/d phased in at a rate of 1 Bcf/d per year (high/slow scenario); and (4) 12 Bcf/d phased in at a rate of 3 Bcf/d per year (high/rapid scenario).

[17] Id.

[18] Id. at 8.

[19] Id.

[20] Id. at 9.

[21] AEO2013 Early Release Overview at 2.

[22] See Steven Mufson, The New Boom: Shale Gas Fueling an American Industrial Revival, Washington Post (Nov. 14 (2012) (reporting that manufacturers have plans to invest as much as $80 billion in U.S. chemical, fertilizer, steel, aluminum, tire and plastics plants); Letter from Edward J. Markey, Ranking Member, House of Representatives Committee on Natural Resources, to Steven Chu, Secretary of Energy (Dec. 14, 2012)("Markey Letter") (stating that AEO2013 domestic demand projections "fail to capture many of the more than 100 newly announced natural gas-intensive manufacturing projects that have been announced over the past 18 months. Those projects represent of $90 billion in investment and billions of cubic feet of additional future daily natural gas use.").

other reason, the operator of the retired plant cannot switch it back on in response to higher natural gas costs. Meanwhile, the EPA's new greenhouse gas standards for new electric generators virtually ensure that new coal plants will not be constructed to replace those that are retired.[23] Soon, electric generation companies will not only demand more gas but also rely on it more heavily for base load production, altering expectations about demand elasticity that prognosticators have relied on when assuming that natural gas prices will not raise sharply due to LNG exports.[24] This same trend would also exacerbate the increases in the price of electricity caused by LNG exports that are projected by the EIA and NERA.

While demand elasticity will shrink in the electric sector, leading to sharper increases in natural gas and electricity prices than previously forecasted, manufacturers will continue to be "responsive" to increases in the price of natural gas—meaning that manufacturers will curtail consumption and hence production due to higher prices. Congress and the DOE need to examine what this means for the economy and the broader public interest of the nation in its consideration of this and other LNG export applications.

Effects of Higher Prices

Increases in the price of natural gas will impact the U.S. consumers who can least afford the price increase, inhibit the expansion of domestic manufacturing, and forestall the further use of natural gas as a bridge fuel away from the carbon-intensive coal and foreign sourced oil for transportation. The NERA study specifically describes the effects of LNG exports and the attendant price increases in terms of a "wealth transfer." The DOE/FE must examine what this wealth transfer would entail for the public interest when evaluating LNG export applications.

Hurts Economically Vulnerable Households

Proposed LNG exports would raise domestic natural gas prices, which will increase costs to households that rely on natural gas for heating and cooking. NERA projects that these higher costs will be offset by increases in the value of natural gas resources and related companies, which NERA assumes many Americans own through retirement savings and other investments.[25] NERA admits, however, that "[h]ouseholds with income solely from wages or government transfers," will not share in the benefits of increased profits from natural gas.[25] Therefore, the increase in natural gas prices due to exports will impact most those consumers without investments or retirement savings, those living paycheck-to-paycheck or relying on government assistance—in other words, the most needy in our society.

Suppresses Other Domestic Industries

The NERA study indicates that as the price of natural gas increases, the economy demands or produces fewer goods and services. This results in lower wages and capital income for consumers; under such economic conditions, consumers save less of their income for investment.

As a result, industries that rely on natural gas will experience "a reduction in overall output," mitigated by a "switch to fuels that are relatively cheaper."[27] The latter argument assumes that alternatives to natural gas are affordable and available, which is an invalid assumption for fertilizer manufacturers and other industries.

Moreover, the NERA study identified chemical manufacturing as one of the natural gas and energy intensive industries that will be among the most severely disadvantaged due to natural gas price increases caused by LNG exports.[28] According to NERA "[d]omestic industries for which natural gas is a significant component of their cost structure will experience increases in their cost of production, which will adversely impact their competitive position in a global market and harm U.S. consumers who purchase their goods."[29] Leaders in the chemical sector have voiced con-

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[23] "Standards of Performance for Greenhouse Gas Emissions for New Stationary Sources: Electric Utility Generating Units" 77 C.F.R. 22392 (Apr. 13, 2012).

[24] See Energy Information Administration, Fuel Competition in Power Generation and Elasticities of Substitution (June 2012) (general description of fuel switching and price elasticity among fuels in the power generation sector) available at http://www.eia.gov/analysis/studies/fuelelasticities/pdf/eia-fuelelasticities.pdf.

[25] See Markey Letter (casting doubt on the assumption that benefits to the natural gas sector will be widely enjoyed by ordinary American via retirement investments).

[26] NERA Study at 8.

[27] NERA Study at 53.

[28] NERA Study at 64

[29] NERA Study at 13.

cern regarding LNG exports and adverse impacts on the industry caused by inflated natural gas prices.[30]

When evaluating whether export applications are consistent with the public interest, policymakers must ask not only "what will we gain from LNG exports," but also "what will we give up." A U.S. manufacturing renaissance that promises greater economic growth and job creation with positive effects rippling throughout the economy hangs in the balance. Right now, industry is poised to invest billions of dollars in new natural gas intensive facilities in the U.S. premised on the promise of low domestic natural gas prices. For example, Sasol North America, Inc. is currently considering investing in the first gas to liquids plant in the U.S., an innovative technology for producing diesel and other liquid fuels without oil, and U.S. natural gas prices are a primary consideration regarding whether the investment will go forward.[31]

Last year, in his State of the Union address, President Obama spoke of "an America that attracts a new generation of high-tech manufacturing and high-paying jobs—a future where we're in control of our own energy, and our security and prosperity aren't so tied to unstable parts of the world," and "an economy built on American manufacturing, American energy."[32] Low natural gas prices in the U.S. provide the path forward. Higher natural gas prices due to LNG exports threaten this nascent return to American manufacturing, and prior economic data demonstrate that when domestic energy prices increase, the country loses manufacturing jobs, particularly in the fertilizer, plastics, chemicals, and steel industries.[33]

Rather than trading a few existing manufacturing jobs for a few natural gas and construction jobs, the DOE/FE should pursue policies that create new manufacturing jobs and broader economic growth in the U.S. Using natural gas for manufacturing provides a value-added benefit to the economy because industry multiplies the value of every dollar it expends on natural gas for energy or as a raw material. Rather than investing in natural gas exports, which squeeze out investments from other sectors of the economy, the U.S. should pursue policies that allow industry to invest in natural gas dependent manufacturing. Energy and natural gas intensive manufacturing produces chemicals, metals, cement and other materials that may be low-value adding but create positive ripple effects up the value-chain and throughout the economy.[34] Rather than exporting natural gas as a raw natural resource, the U.S. could export processed materials, such as steel, or higher value-added goods at more competitive prices, with greater benefits to the U.S. job market and GDP.

Threaten Transition from Coal

Current low natural gas prices provide an opportunity to wean the U.S. off of carbon-intensive coal. Inflated natural gas prices due to LNG exports will decrease the viability of natural gas as a bridge-fuel to a lower carbon future. Current low prices make natural gas-fired electricity generation an economically sound alternative to coal-fired generation. Sustained low prices may encourage this transition by private initiative regardless of increased environmental regulations as investors find natural gas competitive with coal. If exports inflate natural gas prices, the economics turn against cleaner burning natural gas.[35]

In addition, as discussed above, new environmental regulations will soon force coal retirements. Future greenhouse gas regulation could cause additional retirements in the future. If natural gas prices remain low, the U.S. may be able to transition away from carbon intensive coal without causing electricity prices to increase

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[30] Press Release, Dow Chemical, DOE Report on LNG Exports Short Changes Manufacturing and U.S. Competitiveness (Dec. 6, 2012) available at http://www.dow.com/news/press-releases/article/?id=6138

[31] Clifford Kraus, South African Company to Build U.S. Plant to Convert Gas to Liquids, New York Times (Dec. 3, 2012) available at: http://www.nytimes.com/2012/12/04/business/energy-environment/sasol-plans-first-gas-to-liquids-plant-in-us.html?__r=0

[32] President Barack Obama, State of the Union Address (Jan. 24, 2011), transcript available at: http://www.whitehouse.gov/state-of-the-union-2012.

[33] U.S. House Committee on Natural Resources Democrats, Drill Here, Sell There, Pay More: The Painful Price of Exporting Natural Gas (March 2012) available at http://democrats.naturalresources.house.gov/reports/drill-here-sell-there-pay-more.

[34] NERA claims that harm resulting from exports will "likely be confined to very narrow segments of industry," namely low value-added, energy intensive manufacturing. NERA Study at 67-69. NERA, however, ignores the benefits of producing materials in the U.S. that can then be used by other U.S. manufactures that are less energy intensive and higher up the value chain. For instance, if plastics are produced at competitive prices in the U.S., toy manufacturers may find it economical to "re-shore" toy manufacturing plants. Steven Mufson, The New Boom: Shale Gas Fueling an American Industrial Revival, Washington Post (Nov. 14, 2012).

[35] EIA Export Report at 17.

significantly. If natural gas prices are high, however, electricity prices will spike as relatively cheap coal-fired generators are forced to retire for regulatory reasons. Spiking electricity rates will have rippling effects on the U.S. economy, especially energy intensive, cost-sensitive manufacturing.

Keeps the U.S. Dependent on Foreign Oil

Currently, the U.S. imports billions of dollars worth of oil from around the globe, a great deal of which is used as gasoline to fuel vehicles. The replacement of current gasoline-powered fleets with natural gas vehicles would significantly reduce U.S. dependence on foreign oil, and thereby enhance U.S. security and strategic interests and reduce our trade deficit.[36] State governments and businesses are expending substantial resources today to put the needed infrastructure in place.[37]

Automobiles are not the only modes of transportation that businesses are interested in transitioning to natural gas; a company in Canada is investing in commercial locomotives powered by LNG and teaming up with Caterpillar to employ similar technology in heavy duty equipment that currently runs on diesel.[38] If Congress and the DOE allow export applications to go through, the resulting increase in natural gas prices would undermine recent investments to expand natural gas as a transportation fuel.

Policymakers should not pursue an export policy that undermines the efficient, domestic use of a domestic fuel stock and America's first and best opportunity to move toward energy independence by decreasing reliance on foreign oil.

U.S. and Foreign Natural Gas Prices Will Converge

Currently, there are significant disparities between domestic natural gas commodity prices and prices in some nations that rely on LNG imports. These disparities provide would-be exporters with appealing arbitrage opportunities in the short-term, but they will not last. Gas rich shale deposits are a global phenomenon, just now beginning to be tapped. Also, despite relatively low domestic natural gas prices, certain countries, such as Qatar, can produce massive quantities of natural gas at even lower prices. As other nations develop their resources and export capacity and as U.S. natural gas prices increase due to export, international and domestic prices will converge, leaving the U.S. with higher domestic prices that thwart energy independence and that undermine the competitiveness of the manufacturing sector that relies heavily on natural gas as a process fuel.

The U.S. is at the forefront of technology in the development of shale gas reserves. A recent study by MIT concludes that the U.S. should export its technology and expertise.[39] According to MIT, the development of international non-conventional natural gas reserves will create a more liquid market with less disparity between prices around the globe[40]

The U.S. should follow this strategy, instead of spending billions of dollars to build facilities in order to export a commodity that will possibly be abundant worldwide before the LNG export facilities can even be completed.

The U.S. has an opportunity not even imagined two or three years ago to significantly expand its manufacturing sector, transition away from our reliance on coal-fired electricity generation (without risking price shocks), and finally make real progress towards energy independence. All of this, however, depends on relatively low and stable natural gas prices (which sharply contrasts with the history of natural gas price volatility). Congress and the DOE should not turn a blind eye and allow the same businesses that gambled and lost on projections of the need for fu-

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[36] Cheniere and other exporters claim that their proposed exports will benefit the U.S. balance of trade, but it does not consider the benefits to the trade balance of cutting oil imports and exporting value-added goods manufactured in the U.S. with affordable natural gas.

[37] Officials are planning a series of compressed natural gas ("CNG") filling pumps at existing filling stations across the Pennsylvania US Route 6, stretching 400 miles from New York State near Milford, Pike County, Pa. in the east and through Crawford County, Pa. to the Ohio state line on the west, known as "PA Route 6 CNG Corridor;" at the same time, Chesapeake Energy is converting its vehicles in northeastern Pennsylvania to CNG and working with a local convenience-store chain and transit authority to foster further CNG integration. Eric Hrin, Pennsylvania Looks to CNG, The Daily Review Online (May 26, 2011) available at http://thedailyreview.com/news/pennsylvania-looks-to-cng-1.1135267; see also, Texas S.B. 20 (On July 15, 2011, the governor of Texas signed S.B. 20, supporting a network of natural gas-refueling stations along the Texas Triangle between Dallas/Ft. Worth, San Antonio, and Houston. The new legislation will lay a foundation for wider-scale deployment of heavy-duty, mid- and light-duty natural gas vehicles ("NGVs") in the Texas market).

[38] Rodney White, Firm on Track to Build LNG-Fueled Locomotive, Platts Gas Daily (Nov. 28, 2012).

[39] MIT Energy Initiative, The Future of Natural Gas, at 14 (2011).

[40] Id.

ture natural gas imports to now potentially squander our nation's future on what may well turn out to be another failed venture as natural gas production and export capacity develop throughout the world.

APGA respectfully requests that the Committee hold at least one hearing dedicated to examining the domestic impacts of LNG export on consumers and businesses.

Conclusion

APGA appreciates the opportunity to submit testimony to the Senate Committee on Energy and Natural Resources on these two critical natural gas issues. We stand ready to work with the Committee on these and all other natural gas issues.

STATEMENT OF FRED KRUPP, PRESIDENT, ENVIRONMENTAL DEFENSE FUND

The United States is in the midst of a natural gas boom. Shale gas accounted for only two percent of total U.S. natural gas production in 2001.[1] With the development of horizontal drilling, hydraulic fracturing, and advanced seismography, that number has grown extensively to 34 percent in 2011. The U.S. Energy Information Administration projects shale gas will account for 50 percent of domestic natural gas production by 2040, spanning the nation from New York and Pennsylvania to Ohio, Texas, Colorado, and California.[2]

New supplies of domestic natural gas have caused a drop in price that has benefited the economy and the environment alike. Low-cost natural gas is one reason why proposals for new coal-fired power plants have been withdrawn across the country and why old, inefficient, highly polluting coal plants are finally retiring. Environmental Defense Fund recognizes the potentially important benefits this shift from coal to natural gas can achieve, particularly for air quality and the climate.

However, new natural gas development presents serious risks to public health, the environment, and the climate. EDF believes that no community should be forced to sacrifice health or a quality environment for the sake of cheap energy production, nor should the potential greenhouse gas benefits of switching from coal or oil to natural gas be squandered through wasteful production and distribution practices. The opportunity for natural gas to be a net "win" for America depends upon whether we take serious steps to minimize these risks.

Fortunately, there are steps that can be taken now to significantly reduce the risk to public health and the environment from unconventional natural gas operations and to maximize the greenhouse gas benefits that natural gas can provide in comparison with coal or oil. As the committee goes about the important work of assessing the future of natural gas in the United States, I respectfully urge you to consider the following three points.

1. Strong regulation and enforcement is critical to safe production of unconventional natural gas.—Oil and gas production is governed by a web of federal, state, and local regulation. The challenge is to strengthen those strands that are weakest and to add new strands as necessary to ensure that the web is complete. The federal government can start by reviewing how oil and gas development is conducted on land that it owns. The Department of Interior is currently in the process of re-proposing a set of environmental standards for natural gas development on public land, and it is important that these rules be comprehensive and rigorous. I would also recommend that the committee review how states are carrying out their responsibilities and what the federal government can do to support them in their necessary and important work, both individually, and collectively through organizations such as the Groundwater Protection Council.

2. Measuring and reducing fugitive methane emissions is an urgent task.—The primary constituent in natural gas is methane—a powerful greenhouse gas many times more potent than carbon dioxide itself over 20 years. Even small leaks of natural gas at the wellhead or along the infrastructure used to process and transport the gas to our power plants, home, and businesses can work to undo much, if not all, of the greenhouse gas benefits we think we are getting when we substitute natural gas for coal or oil.

A paper published in the Proceedings of the National Academy of Sciences (PNAS) last April concluded that for natural gas to have a net climate benefit, methane

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[1] SECRETARY OF ENERGY ADVISORY BOARDD, SHALE GAS PRODUCTION SUBCOMMITTEE 90-DAY REPORT 6 (Aug. 18, 2011), available at http://www.shalegas.energy.gov/resources/081811_90_day_report_final.pdf.

[2] U.S. Energy Information Administration, Annual Energy Outlook Early Release 2012, http://www.eia.gov/forecasts/aeo/er/executive_summary.cfm

leakage needs to be reduced to one percent or less. This finding was based on the best available science, which indicated that natural gas offered a climate advantage, when substituting natural gas for other fuels used in electric generation or transportation. Current EPA data estimates methane leakage at approximately 2.5 percent, and even the American Petroleum Institute believes that the leakage rate is greater than 1 percent.

Reducing methane from the oil and gas sector can achieve significant benefits, and while efforts are underway to replace leakage estimates with hard data, we know enough and have the technology to get started now. Enormous climate benefits could be realized if a 1 percent methane emissions target is achieved—comparable to the impact that increasing the fuel economy by about 10 miles per gallon across the entire U.S. light-duty vehicle fleet could yield by 2035.

EPA's recently finalized national emissions standards for the oil and gas sector helped to create a strong foundation on which to build. Those standards, however, did not explicitly address methane, and as a result, left too many emissions unaddressed. Right now there are three steps that EPA can take to reduce methane emissions from the oil and gas sector:

- Include all significant methane emissions sources in the national emissions standards.—The NSPS included green completion requirements, but limited those requirements to gas wells. Market fundamentals, however, have driven producers to target oil-rich deposits that produce significant amounts of gas. While the full scope of emissions from these sources is not precisely known, we know they can produce a lot of emissions and they're growing fast. In addition to emissions resulting from oil and gas co-producing wells, other important sources to address are liquids unloading activities and leaky equipment at wellsites. By building out these protections, we can ensure new sources are deploying state-of-the-art pollution control technologies to reduce methane emissions.
- Existing sources.—New sources are only part of the problem. We need rigorous protections for existing sources in the oil and gas sector under the NSPS. EPA can also help to lay the groundwork by encouraging states with ozone non-attainment concerns to deploy oil and gas controls as cost-effective solutions. EPA can do this by providing clear pollution control guidelines, documenting emissions reductions states can achieve, and by underscoring the obvious cost advantages of emission reductions from the oil and gas sector.

  Accountability.—Finally, it is important for EPA's greenhouse gas reporting program for oil and gas sources to be comprehensive by expanding coverage to sources that don't currently have to report (like co-producing wells and gathering and boosting infrastructure). Additionally, EPA should move away from emissions factors and non-standardized measurement methodologies and toward reliance on direct, continuous emissions measurement.

3. Natural gas is only a piece of our energy future.—We cannot allow the recent abundance and market conditions of natural gas to distract us from pursuing the policies that continue our nation's progress in developing the energy technologies and services necessary to accelerate our transition to a modern, clean, low-carbon energy economy. Numerous studies demonstrate that natural gas is not a panacea. Investments in energy efficiency and renewables, along with a transmission and distribution grid capable of supporting them, are critical to our nation's energy future. There is much that the federal government can and should do to accelerate the development and deployment of efficiency and renewables, and I would be pleased to share these ideas with the committee at the appropriate time.

Natural gas has indeed transformed our nation's energy mix. And the economic and environmental benefits of natural gas are clear. But the jury is still out on whether gas production can and will be done safely and responsibly—and whether it will help or hurt our efforts to solve climate change. Getting strong, effective rules in place is the key. Irrespective of whether the U.S. becomes an LNG exporter, or whether the nation expands the use of natural gas vehicles, natural gas needs to be produced responsibly. If we fail, the positive role it can play in helping to accelerate our transition to a clean, low-carbon energy future will be lost.

STATEMENT OF PAUL KOUROUPAS, VICE PRESIDENT OF PUBLIC POLICY, VNG.CO, BALA CYNWD, PA

My name is Paul Kouroupas. I am the Vice President of Public Policy of VNG.CO (VNG), a start-up compressed natural gas refueling infrastructure company based

in Bala Cynwd, Pennsylvania. VNG offers a nationwide retail CNG fueling program to support the widespread use of light-duty natural gas vehicles (NGVs). VNG will install, operate and maintain CNG fueling equipment, co-located within existing retail gasoline stations. VNG will initially deploy its compressed natural gas pumps to support fleets with CNG fueling services in the retail market and ultimately expand its deployment to support the mass-market consumer segment.

SUMMARY

The purpose of the present hearing is to "explore opportunities and challenges associated with America's natural gas resources." By and large, the current discussion has focused on the benefits of low-cost natural gas for chemical and manufacturing companies, as well as the benefits (and potential costs) of allowing gas producers to export this resource overseas. While these opportunities are considerable and certainly merit discussion, this focus misses the greatest opportunity for natural gas to improve our economy, environment, and national security while also benefitting American consumers directly: the potential of natural gas to fuel light-duty vehicles on a mass-market basis, which could be our most potent weapon in the fight to eliminate U.S. dependence on foreign oil.

On behalf of VNG, I am pleased to share with the members of the Committee our company's perspective on the unique benefits of using natural gas to fuel light-duty NGVs, as well several minor regulatory changes that can unleash these benefits for the American economy.

- NGVs provide direct benefits to consumers—Development of the light-duty NGV market allows Americans to directly benefit from the shale revolution, instead of limiting direct benefits to manufacturers, trucking fleets, or exporters. With natural gas priced 40% below gasoline for a gallon equivalent, the average U.S. household that currently spends $3,000 per year on gasoline could save $1,200 per year on fuel costs with natural gas.
- The greatest mass-market potential of any alternative fuel—With over 15 million light-duty NGVs on the road worldwide, NGVs are an established technology, and the shale gas revolution gives America unprecedented potential to commercialize them on a mass-market basis. The National Petroleum Council of the U.S. Department of Energy last year released a comprehensive report analyzing alternative fuels and concluded that NGVs have the potential to achieve 17% of new light-duty vehicle sales by 2020—far higher than other alternatives, which face significant technological obstacles and higher costs.
- International clean energy technology leadership—Development of the domestic market for light-duty NGVs can help U.S. automakers lead in the burgeoning international NGV market, which is already growing rapidly in countries like Germany, Italy, Brazil, and Argentina. NGVs can also serve as a platform for innovation and development of renewable natural gas (RNG) and hydrogen fuel cell technologies, gaseous fuels which can dramatically reduce transportation GHG emissions.

Despite this unique potential, light-duty NGVs have received relatively little attention from policymakers, and this technology still suffers from an uneven playing field compared to other transportation alternatives like electric vehicles (EVs) and biofuels. As the Committee considers the various opportunities and challenges associated with America's natural gas abundance, the light-duty NGV market ought to be included in the discussion as perhaps the greatest opportunity of all, and lawmakers should seek to provide NGVs with a level playing field compared to other alternative fuels. There is substantial private investment in compressed natural gas (CNG) fueling infrastructure and automakers are beginning to offer a growing breadth of vehicles that run on CNG. By leveling the playing field for NGVs, Congress will encourage additional private investment.

THE LIGHT-DUTY NGV OPPORTUNITY

The ability of natural gas to serve as a fuel for heavy-duty fleets has been well known to policymakers for many years, but these vehicles consume just a quarter of the total on-road fuels in the U.S.[1] Thanks to the vast new low-cost gas supplies unlocked by the shale drilling revolution, it is now possible to consider the potential to bring the benefits of natural gas fuel to the light-duty cars, vans, SUVs and

[1] Energy Information Administration. "Annual Energy Outlook." 5 Dec 2012 http://www.eia.gov/forecasts/aeo/er/index.cfm

pickups that are driven by U.S. business and government fleets as well as families that consume 75% of U.S. on-road fuels.

Despite a relative lack of policy support, U.S. automakers and natural gas refueling infrastructure providers like VNG have already recognized the enormous opportunity represented by the light-duty NGV market. GM and Chrysler have both introduced new bi-fueled[2] NGV versions of popular pickup truck models for fleet customers, and VNG is working to develop the kind of retail-oriented fueling infrastructure for these fleets that will also seed the market for future mass-market consumers. Furthermore, natural gas producers like Chesapeake and Encana are making their own efforts to promote widespread adoption of natural gas in recognition of the fact that this market could be vital to the long-term profitability of the U.S. gas drillers.

While progress is already being made by the private sector in developing the light-duty NGV market, greater policymaker understanding of NGVs and support for a level playing field for them will help this market achieve its full potential sooner.

Light-Duty Vehicles Are Chief Driver of Oil Dependence

Transportation accounts for 70% of U.S. oil consumption and 30% of greenhouse gas emissions, making it a critical sector to address in the pursuit of U.S. energy independence and climate change goals. And, while other sectors of the economy (including power, manufacturing, and home heating) have moved away from oil use over the past three decades, the transportation sector is still almost completely dependent on gasoline and diesel, leaving U.S. businesses, government, and households at the mercy of volatile global markets. Increasing domestic production of unconventional oil is a welcome development, but it does not affect our vulnerability to global price swings, nor is it sufficient to significantly reduce global prices.

Light-duty vehicles (including cars, SUVs, vans, and pickups) are the main source of this dependency, accounting for 75% of on-road transportation fuel use in the U.S. According to new data from the EIA, the average American household spent nearly $3,000 on gasoline to fill these light-duty vehicles last year—nearly 4% of household pretax income, the highest level in three decades.[3] Addressing the near-total dependence of light-duty vehicles on oil must remain a central priority of U.S. energy policy, for the sake of the economy, our national security, and the environment.

Other Alternatives Are Falling Short of Expectations

While policymakers have touted various preferred alternative fuel technologies in recent years, these technologies have failed to make an impact thus far and may not for the foreseeable future.

- Electric Vehicles—Sales of the Chevy Volt and Nissan Leaf in 2012 were less than half of automaker projections, combining for less than 35,000 sold nationwide.[4] The Administration, a staunch backer of EV technology in the 2009 stimulus bill, recently acknowledged the struggles of the industry and backed off its 2011 goal of having one million plug-in electric vehicles on U.S. roads by 2015.[5] In fact, some industry observers believe that EVs will not be able to overcome the cost and recharging issues that limit their appeal to consumers until there is a new breakthrough in battery technology—which could be decades away.[6]
- Cellulosic Biofuels—Both the current and previous Administrations have hailed the potential of cellulosic biofuels made from non-food feedstocks to provide a sustainable source of renewable transportation fuel. However, this technology faces fundamental challenges in cellulosic feedstock production and distribution as well as the high cost of processing these feedstocks into fuels, which have prevented any significant commercial volume of these fuels from being produced despite government mandates for millions of gallons per year under the Renew-

[2] Bi-fuel natural gas vehicles are capable of running the same internal combustion engine on either gasoline or natural gas. Retaining a gasoline tank while the natural gas refueling infrastructure is being developed eliminates drivers' "range anxiety."

[3] U.S. Energy Information Administration. "U.S. household expenditures for gasoline account for nearly 4% of pretax income." 4 Feb 2013. http://www.eia.gov/todayinenergy/detail.cfm?id=9831

[4] Eisenstein, Paul. "Are battery-powered cars losing their charge?" Autoblog. 6 Dec 2012. http://www.autoblog.com/2012/12/06/are-battery-powered-cars-losing-their-charge/

[5] Rascoe, Ayesha and Deepa Seetharaman. "U.S. backs off goal of one million electric cars by 2015." Reuters. 31 Jan 2013. http://www.reuters.com/article/2013/01/31/us-autos-greencars-chu-idUSBRE90U1B020130131

[6] Borenstein, Seth. "What holds energy tech back? The infernal battery." Associated Press. 22

able Fuels Standard.[7] Indeed, a district court recently vacated EPA's 2012 requirement for cellulosic biofuels due to a lack of availability.[8]

While both EV and advanced biofuels technologies may hold merit in the long term, the fact is that both face substantial near-term technological barriers to their success. The seriousness and urgency of our near-total transportation dependence on oil requires a focus on solutions that are ready to make a difference today—not technology gambles that may or may not become a viable solution five or ten years down the road.

"Larger, Faster, Earlier" Impacts for Light-Duty NGVs

In contrast to EVs and biofuels, NGVs are the only alternative fuel solution to offer a ready technology at an affordable price—today. Natural gas can save drivers up to 40% on fuel costs (or $1,200 per year based on average household gasoline expenses of $3,000), and our vast shale reserves guarantee stable, low-cost domestic supplies for decades. Light-duty NGVs are also a proven technology with no 'learning curve' similar to electric vehicles (EVs)—indeed, there are over 15 million light-duty NGVs on the road worldwide in countries in Europe, Asia, and South America.[9] Since the engine and performance is the same, natural gas can power any sort of vehicle that currently uses gasoline, and fleets and consumers can continue to buy the vehicles they like and need.

These advantages were recognized in a landmark new comprehensive study of alternative fuel technologies by the National Petroleum Council of the U.S. Department of Energy. According to this "Future Transportation Fuels" report*, NGVs have potential for "larger, earlier, and faster" impacts on U.S. oil dependence compared to other alternatives due to a lack of technological barriers combined with the economic rationale presented by fuel savings. In the composite "best case" scenario developed by the NPC, light-duty NGVs were able to achieve a 17% share of new light-duty vehicle sales by 2020—double the share of plug-in hybrid electrics (PHEVs) and pure EVs combined.[10]

A key finding of the NPC report* is the potential for rapid cost reductions in the incremental costs of NGVs compared to gasoline vehicles through simple manufacturing economies of scale. While today's NGV incremental costs in the U.S. may be $10,000 or more, this is due to the inefficiencies of low-volume conversions, and not due to the use of expensive components (as is the case with EVs, whose even greater incremental costs are due to costs of lithium-ion batteries, which are already mass produced). The NPC projects that incremental costs could be reduced by 2/3rds in the near term with a move to high-volume, assembly-line production of 100,000 vehicles/year.

The European experience clearly shows that rapid cost reductions of this magnitude are possible. Indeed, in Italy, Fiat already sells some bi-fuel models at an incremental cost of less than $3,000, and Opel (the European arm of GM) is offering rebates that can completely eliminate incremental costs.[11] This ability to achieve incremental cost reductions in the near term without need for any technological advances is key to understanding the vastly greater potential of NGVs compared to other alternatives, as it gives NGVs a realistic path towards mass-market viability—without the need for long-term subsidies. EVs and advanced biofuels simply cannot claim a similar path, as both depend on subsidies and technological breakthroughs which may or may not materialize even in the long term.

An Opportunity for U.S. Companies to Lead in Key Clean Energy Technologies

NGVs may be an established technology compared to EVs and biofuels, but the global market for these vehicles is just beginning to realize its potential. U.S.-developed shale gas drilling technology is being exported to countries all over the world, helping to usher in what the International Energy Agency has called a "Golden Age

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[7] Congressional Research Service. "Renewable Fuel Standard (RFS): Overview and Issues." 23 Jan 2012. http://www.fas.org/sgp/crs/misc/R40155.pdf

[8] Green Car Congress. "DC Circuit court vacates 2012 cellulosic RFS standard, affirms 2012 advanced biofuel standard." 27 Jan 2013. http://www.greencarcongress.com/2013/01/api-20130127.html

[9] Gas Vehicles Report. http://www.ngvjournal.com/en/magazines/the-gvr/download/3523/11378/26

*All reports have been retained in committee files.

[10] National Petroleum Council. "Future Transportation Fuels Study." Aug 2012. http://www.npc.org/FTF-80112.html

[11] Ebhardt, Tommaso and Craig Trudell. "Gasoline Sticker Shock Fuels Fiat Natural Gas Auto Sales." Bloomberg. 17 Sept 2012. http://www.bloomberg.com/news/2012-09-17/gasoline-sticker-shock-fuels-fiat-natural-gas-auto-sales.html

of Gas."[12] By establishing America as the center of development for NGVs in the years ahead, U.S. automakers will be positioned to take advantage of new opportunities in overseas markets in Asia, Europe, and South America that are just beginning to develop their shale gas resources.

NGVs are also a platform for the development of even cleaner, ultra-low-carbon transportation fuels and technologies that will be needed to combat climate change. NGVs can fuel on biogas (or renewable natural gas, or "RNG") captured from landfills, wastewater plants, and other sources, resulting in ultra-low lifecycle GHGs of 90% below gasoline or less.[13] Moreover, unlike cellulosic biofuels mandated in the RFS, biogas is a renewable fuel derived from non-food feedstocks that is being produced and used in commercial applications today.[14]

In the longer term, natural gas will also facilitate the development of hydrogen fuel cell vehicles (FCVs) due to numerous fuel storage and refueling infrastructure synergies between these gaseous fuels.[15] FCVs are a crucial technology for meeting long-term climate change goals, combining the zero-emission performance of EVs with the gasoline-like range and refueling characteristics of NGVs.

In comments on the 2017-2025 light-duty vehicle regulations,[16] VNG argued that the development of the light-duty NGV market would reduce several specific "near-term market barriers to FCV adoption" identified by EPA and NHTSA, including:

- Refueling Infrastructure—NGV refueling stations use most of the same hardware used to dispense hydrogen fuel, enabling them to be adapted to supply hydrogen or even hydrogen-natural gas blends in the future;
- Fuel Cost—Hydrogen produced through the steam reforming of natural gas is the lowest-cost method of distributed hydrogen production available today;
- Vehicle Cost—Natural gas and hydrogen also share gaseous storage technologies, and innovations and cost improvements for advanced on-board storage and fuel management technologies for NGVs will benefit FCVs as well.

The EPA acknowledged these linkages in its rationale for giving NGVs additional "advanced technology" multiplier incentives in the new 2017-2025 light-duty vehicle regulations, and cited VNG's comments as well as those of Natural Gas Vehicles for America in support of this decision.[17]

MAXIMIZING DOMESTIC BENEFITS OF THE U.S. GAS BOOM

Despite concerns expressed by some parties over potential increases in natural gas demand from NGVs or LNG exports, the reality is that the shale gas revolution has unlocked an enormous amount of natural gas supply capacity that can be tapped at relatively low costs.

- A recent study by (hearing witness) Dr. Kenneth Medlock III of the James Baker III Institute for Public Policy[18] finds that shale gas supplies have effectively increased the elasticity of domestic gas supplies fivefold. Thus, the long term price of gas will remain between $4-$6 per MMCF for "decades" even with substantial increases in demand.
- Chesapeake Energy has similarly noted that, based on the production economics of current domestic gas plays, the U.S. could add gas production sufficient to meet the fuel needs of 2/3rds of the entire domestic light-and heavy-duty transportation fleet while maintaining long-term natural gas prices of less than $7 per MMCF—still low by historic standards.

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[12] International Energy Agency. "Are we entering a golden age of gas?" World Energy Outlook 2011. http://www.worldenergyoutlook.org/goldenageofgas/

[13] National Petroleum Council. "Renewable Natural Gas for Transportation." 1 Aug 2012. http://www.npc.org/FTF__Topic__papers/22-RNG.pdf

[14] Energy Vision. "Renewable Natural Gas: The Solution to a Major Transportation Challenge." 2012. http://energy-vision.org/wordpress/wp-content/uploads/2012/05/EV-RNG-Facts-and-Case-Studies.pdf

[15] Cannon, James S. "Natural Gas: An Essential Bridge to Hydrogen Fuel Cell Vehicles." January 2012. http://vng.co/wp-content/uploads/2012/05/Natural-Gas-An-Essential-Bridge-To-Hydrogen-Fuel-Cell-Vehicles.pdf

[16] VNG.CO. "Comments of VNG.CO." 6 Feb 2012. http://vng.co/wp-content/uploads/2012/05/Natural-Gas-As-Essential-Bridge-To-Hydrogen-Fuel-Cell-Vehicles-With-Comments.pdf

[17] Federal Register. "2017 and Later Model Year Light-Duty Vehicle Greenhouse Gas and Corporate Average Fuel Economy Standards; Final Rule." 15 Oct 2012. P. 62814. http://www.gpo.gov/fdsys/pkg/FR-2012-10-15/pdf/2012-21972.pdf

[18] Medlock, Dr. Kenneth. "U.S. LNG Exports: Truth and Consequences." August 2012. http://bakerinstitute.org/publications/US%20LNG%20Exports%20-%20Truth%20and%20Consequence%20Final—Aug12-1.pdf

When considering the "opportunities and challenges" for natural gas, light duty NGVs offer the opportunity to save consumers an average of $1,200 per year on their fuel costs, reduce greenhouse gas emissions by 24% (and up to 90% with renewable natural gas), and achieve energy independence by replacing oil use in the vehicles consuming 75% of on-road transportation fuels. And if the domestic NGV market develops robustly, natural gas producers will have strong domestic demand for their product, reducing the incentive to export natural gas—and its economic, environmental, and energy security benefits—overseas.

POLICY CHANGES TO LEVEL THE PLAYING FIELD FOR NGVS

Policymakers can realize this vision for light-duty NGVs simply by providing them with a level playing field to compete with other alternative fuel technologies, potentially including the following steps:

- Remove Regulatory Barriers—While the new 2017-2025 light-duty vehicle regulations promulgated by EPA and NHTSA take important steps towards creating a level playing field for NGVs, they still face arbitrary and unfair obstacles under the CAFE program due to outdated legislative restrictions intended to limit credits for E85 flex-fuel vehicles. Legislation is necessary to harmonize treatment for NGVs, granting them the fair, no-cost regulatory incentives that EPA and NHTSA have already said they deserve.
- Tax Credit Parity for NGVs—EVs currently benefit from tax credits of up to $7,500 per vehicle included in the 2009 stimulus bill, while light-duty NGVs receive no tax credits. As detailed in the NPC report, although NGVs do not face the same long-term cost obstacles as EVs (which are unique to EV dependence on expensive lithium-ion battery packs), incremental NGV costs are high today simply due to low production volumes. The current Administration has previously advocated for identical tax credits for both EVs and NGVs,[19] and such a level playing field would help increase NGV demand and bring down prices in the near term.
- Federal Vehicle Fleets—Federal vehicle fleets should be leaders in adopting light-duty NGVs, which would save taxpayer money through lower fuel costs, help reduce vehicle costs for consumers and businesses through increasing production economies of scale, and support the private sector development of retail-oriented CNG refueling networks for public use. However, current federal fleet procurement of alternative fuel vehicles is focused almost entirely on flex-fuel E85 vehicles due to their low incremental costs—despite the fact that these vehicles may end up costing more over their lifetime due to E85 costs that are higher than gasoline on a per-BTU basis. E85 also yields fewer environmental and energy security benefits than natural gas. Federal fleets should be required to evaluate the lifecycle costs and benefits of all fleet purchases, which would reward the superior cost savings and environmental performance of NGVs.
- Alternative Fuel Standard—The current RFS, which as noted calls for unattainable volumes of cellulosic biofuels that do not yet exist, is broken and unfairly focuses only on biofuels. Expanding this program to an "Alternative Fuel Standard" would allow refiners to meet requirements with credits generated by any alternative fuel that reduces GHG emissions by 20% or more—including CNG and electricity as well as biofuels. This type of "fuel neutral" policy would encourage much more rapid progress towards energy independence goals than the current biofuel-only RFS.

VNG played an active role in facilitating recent progress on the regulatory treatment of NGVs by EPA, and is recommending Congress take additional action to address these issues that cannot be addressed simply through administrative action.

VNG appreciates the opportunity to submit this testimony and looks forward to working with the Committee and other policymakers to support the light-duty NGV market, which will reduce the cost of driving for American households and businesses, reduce climate change impacts for transportation, and help this country achieve energy independence. If you have any questions or would like additional information, please contact me at pkouroupas@vng.co (973-886-7675).

[19] The White House. "Fact Sheet: All-of-the-Above Approach to American Energy." 7 March 2012. http://www.whitehouse.gov/the-press-office/2012/03/07/fact-sheet-all-above-approach-american-energy

STATEMENT OF AMERICAN CHEMISTRY COUNCIL

February 12, 2013 The American Chemistry Council* is pleased to submit for the hearing record our Executive Committee's unanimously approved position related to energy and competitiveness (see attached). The policy re-emphasizes our strong support for a comprehensive "all of the above" energy strategy to support U.S. economic growth and the growth of the chemical industry.

The policy also restates ACC's support for free market policies that promote the export of American-made goods, including liquefied natural gas. The Executive Committee unanimously expressed its opposition to any new export bans or restrictions on liquefied natural gas, such as a moratorium on export terminals or the prohibition on the export of natural gas produced on public lands.

While there is broad agreement among ACC members on these key principles, there is not a clear consensus on the issue of whether the Natural Gas Act's public interest requirement should be further defined in export permitting to non-FTA countries.

ACC will continue to discuss this issue. ACC members will also continue to work together to vigorously advocate for sound energy and related regulatory policies that will ensure the availability of abundant, diverse energy supplies and stable reliable energy markets.

*The American Chemistry Council (ACC) represents the leading companies engaged in the business of chemistry. ACC members apply the science of chemistry to make innovative products and services that make people's lives better, healthier and safer. ACC is committed to improved environmental, health and safety performance through Responsible Care®, common sense advocacy designed to address major public policy issues, and health and environmental research and product testing. The business of chemistry is a $760 billion enterprise and a key element of the nation's economy. It is one of the nation's largest exporters, accounting for ten cents out of every dollar in U.S. exports. Chemistry companies are among the largest investors in research and development. Safety and security have always been primary concerns of ACC members, and they have intensified their efforts, working closely with government agencies to improve security and to defend against any threat to the nation's critical infrastructure.

ACC POLICY ON ENERGY AND COMPETITIVENESS

ACC supports public policies that promote the availability of competitively priced natural gas and feedstock to support the continued growth of the chemical industry in the United States. To that end, ACC supports free trade principles in the context of U.S. energy policy. Natural gas has enormous potential to renew and grow the American chemistry industry, the entire domestic manufacturing sector, and the U.S. economy at large, creating jobs and more exports of manufactured goods. America needs to couple rules-based free trade principles with an "all of the above" energy strategy to ensure we are fully developing our domestic energy resources, including natural gas, and taking full advantage of each energy source to promote sustained economic growth.

ELEMENTS OF ACC POLICY ON ENERGY AND COMPETITIVENESS

- ACC supports a market-based "all of the above" national energy policy anchored in maximizing access to competitively priced domestic energy supplies, using energy efficiently and developing a diverse set of energy sources.
- An abundant, competitively priced and reliable supply of natural gas and natural gas liquids (NGLs) has created a manufacturing renaissance in the United States. ACC supports policies that promote our industry's competitive advantage, such as public policies and positions that encourage the responsible production of natural gas and NGLs.
- As America's largest export industry, we support exports of American-made products, including liquefied natural gas (LNG).
- ACC supports the application of existing trade rules (including WTO commitments and bilateral Free Trade Agreements) to all exports, including LNG.
- Consistent with U.S. trade laws, we oppose imposition of any new LNG export bans or restrictions, such as those that would impose a moratorium on export terminals or prohibit exports of gas produced on public land. We support full compliance with the Natural Gas Act in the issuance of LNG export permits, including the presumption that exports to Free Trade Agreement countries are in the public interest.
- There is a lack of clear consensus among our members concerning whether the Natural Gas Act's "public interest" requirement should be further defined in ex-

port permitting for non-FTA countries. ACC therefore will further study this issue and ways to achieve consensus.

- ACC will also continue to monitor the U.S. energy situation, including natural gas supply/demand scenarios, and their implications for global competitiveness of the industry.

STATEMENT OF BILL COOPER, PRESIDENT, CENTER FOR LIQUEFIED NATURAL GAS

As President of the Center for Liquefied Natural Gas, I would like to thank Chairman Ron Wyden and Ranking Member Lisa Murkowski of the Senate Energy and Natural Resources Committee for accepting the following testimony, to be entered into the public record.

I will be focusing on the topic of liquefied natural gas (LNG) exports, specifically by identifying common myths and then providing a summary of the facts. As you will see from this testimony, the United States has abundant supplies of natural gas, more than enough to allow for exports while also meeting growing domestic demand.

The ability to export LNG represents a window of opportunity to create more jobs, generate more public revenues and reduce our trade deficit. A multitude of industries and communities will benefit from this opportunity to export some of America's abundant natural gas resources in global markets.

By resuming its approval process for LNG export applications, the U.S. Department of Energy can allow the United States to begin reaping those benefits, without hurting U.S. consumers.

MYTH 1—We should use natural gas here in the United States instead of exporting it.

Data compiled by the U.S. government and independent experts show clearly that the United States has an abundant supply of natural gas, more than enough to meet growing domestic demand and allow for exports.

For example, the U.S. Energy Information Administration's 2013 Annual Energy Outlook shows that U.S. natural gas production is projected to grow by roughly 40 percent from 2012 to 2040. Over the same period, U.S. consumption of natural gas is expected to grow by less than 20 percent. Because production of U.S. natural gas is projected to rise faster than consumption by 2040, the U.S. has a natural gas surplus available for export.

Meanwhile, a recent report from Deloitte observed the following:

> Producers can develop more reserves in anticipation of demand growth, such as LNG exports. Indeed, LNG export projects will likely be backed by long-term supply contracts, as well as long-term contracts with buyers. There will be ample notice and time in advance of the exports to make supplies available.

Furthermore, reports from the Brookings Institution, the Congressional Research Service and the Baker Institute at Rice University—among many others—have stressed the enormous size of America's natural gas resource base, which in turn underscores the large surplus, a portion of which the United States can leverage for exports to create additional jobs, new tax revenues and a reduction in our trade deficit.

In addition to fundamental economic realities about the benefits of free trade, this large natural gas surplus is a key reason why a recent macroeconomic report from the U.S. Department of Energy concluded that "LNG export has net benefits to the U.S. economy." The DOE report also observed that exports would specifically benefit consumers by stating that the net result of allowing LNG exports "is an increase in U.S. households' real income and welfare." The report added that "consumers, in aggregate, are better off as a result of opening up LNG exports."

MYTH 2—Natural gas exports would harm U.S. manufacturing.

Many of the largest U.S. manufacturers have voiced support for LNG exports. Companies like General Electric and Caterpillar, for example, have both written to the U.S. Department of Energy urging approval for LNG export applications, stressing the economic benefits that exports would yield, as well as the potential economic harm from retaliatory trade restrictions that other countries could impose upon the United States.

In a blog post entitled "Banning LNG Exports Will Hurt Jobs and Economy," the National Association of Manufacturers observed the following:

> Proposals that seek to limit LNG or coal or any other product would have far-reaching negative effects on the United States and should be rejected.

> Such restrictions limit economic opportunities and stifle job growth rather than provide a source of increased economic growth.
>
> Export growth has created and saved manufacturing jobs over the past few years, which were tough economically for the United States. Export growth is vital not just for businesses across-the-board that directly export, but also for the many manufacturers in the supply chain.

In its Initial Comments to DOE on the NERA LNG Export Study, the National Association of Manufacturers also noted:

> With 95 percent of the world's consumers outside the United States, export bans on any product, including LNG, can be expected to have far-reaching negative effects, including on domestic economic opportunities, employment and ultimately economic growth.
>
> The United States' ability to challenge other countries' existing exports restraints on agricultural, forestry, mineral and ferrous scrap products—just to name a few—will be virtually non-existent if the United States itself begins imposing its own export restrictions. Even worse, as the world's largest economy and largest trading country, U.S. actions are often replicated by our trading partners to our own dismay. If the U.S. were to go down the path of export restrictions, even more countries would quickly follow suit and could easily limit U.S. access to other key natural resources or inputs that are not readily available in the United States.

As added proof, major chemical manufacturers that also support LNG exports are moving forward with plans to invest billions of dollars to expand their existing petrochemical operations. Put simply, companies would not be investing heavily in operations that rely on affordable and abundant supplies of natural gas and natural gas liquids (NGLs) if LNG exports truly posed a credible threat to that business.

MYTH 3—Unfettered exports could undermine our economic competitiveness.

In addition to the points outlined above, which detail how LNG exports would actually grow the U.S. economy, it's important to note that arguing against "unfettered" or "uncontrolled" exports is a straw man. There is no such thing as unfettered or uncontrolled LNG exports.

The U.S. government—through the Department of Energy (DOE) and the Federal Energy Regulatory Commission (FERC)—has a robust regulatory review process in place for LNG exports. Absent affirmative evidence from opponents that the proposed project is not in the "public interest," DOE is required to approve the applications, thereby assuring a level playing field for all participants. Further studies are not warranted; the NERA study was robust with 63 scenarios including high and low side supply/demand cases. Every export scenario yielded positive net benefits for the U.S. economy. The DOE has also been studying LNG exports for more than one year already. DOE needs to actively resume the review process for all projects in the permitting queue and it needs to move expeditiously on those applications.

The opportunity to export liquefied natural gas (LNG) will not remain on the table on the same scale, with the same benefits, indefinitely. The U.S. is not the only nation with abundant shale gas reserves. And while some debate the value of free trade in a global economy, other nations are trying to duplicate the success of America's shale industry.

Worldwide demand for LNG between 2020 and 2025 is projected to be around 60 billion cubic feet per day (bcf/d), up from approximately 37 bcf/d today. The sizeable gap between future demand and current capacity, 23 bcf/d, makes the global LNG market an attractive opportunity. However, the United States is not the only nation capable of seizing this opportunity.

The capacity of non-U.S. projects that are either planned, proposed or under construction is approximately 50 bcf/d. In fact, proposed foreign LNG capacity is more than double the expected global market opportunity in 2025. If you add on proposed U.S. LNG capacity, the global marketplace has a proposed supply of 80 bcf/d competing to fill only 23 bcf/d of demand. The longer the U.S. delays, the more likely other nations will satisfy that demand.

MYTH 4—Exports will lead to significant price increases for natural gas in the United States.

Numerous assessments of potential LNG exports have found that any impact on domestic prices would be minimal.

For example, the Brookings Institution observed that producers of natural gas "will likely anticipate future demand from LNG exports and will increase production accordingly, limiting price spikes." Brookings also noted that any price impact would be "modest." Kenneth Medlock with the Baker Institute has said: "The impact on U.S. domestic prices will not be large if [LNG] exports are allowed."

In a report commissioned for the U.S. Department of Energy, NERA Economic Consulting found that "price changes attributable to LNG exports remain in a relatively narrow range across the entire range of scenarios," adding that any such price changes "do not offset the positive impacts" from exports.

What many opponents of exports cite in reference to prices is the EIA's price impact study from 2012, which analyzed four different export scenarios. In the most dramatic (and most unlikely) scenario, the model suggested an extreme upper limit price impact of 54 percent. But the scenario that many experts agree is the most likely is that natural gas price impacts would peak at less than 10 percent. At least one analysis, from Deloitte, pegged the price impact at only two percent.

To provide a real-world example of how the price issue differs in rhetoric from reality, Methanex is relocating one of its methanol plants from Chile to Louisiana to take advantage of abundant and low-cost natural gas supplies. Addressing the export concern head on, Methanex CEO John Floren said it signed long-term supply contracts to hedge against any potential price impacts, reflecting a fundamental market reality of chemical manufacturing in the United States that undermines the suggestion that future price volatility would prevent the future growth of this industry.

Interestingly, at least one of the chemical companies that has voiced opposition to LNG exports on the basis of price impacts has stated that if "natural gas were available at a consistent $6-$8 dollar per MMBtu range, U.S. petrochemical facilities could be globally competitive." Current Henry Hub natural gas prices are less than $3.50 per MMBtu, meaning even in the worst-case and most unrealistic scenario modeled by EIA (where LNG exports increase domestic prices by 54 percent), the cost of natural gas would be $5.39 per MMBtu—below the price range that at least one major chemical manufacturer has said publicly would keep the industry competitive.

A common criticism by opponents of LNG exports is that natural gas production will lag demand, causing price spikes if there are LNG exports. Since 2008, we've seen production increase by 10 bcf/d and natural gas prices fall by more than $8 per thousand cubic feet (mcf). Clearly, natural gas production was running faster than demand or there wouldn't have been such a dramatic decline in natural gas prices. Given the new shale gas realities, producers should be able to ramp up production in anticipation of demand growth.

MYTH 5—The "value-add" for exports is low.

According to the U.S. International Trade Administration (ITA), each $1 billion of exports could result in more than 5,000 new jobs, many of which would be permanent manufacturing jobs. Thus, $13 billion to $25 billion worth of LNG exports—the current range of investment possibilities—could mean the creation of between 70,000 and 140,000 new American jobs. ITA has also observed that the value per export-supported job is almost $165,000.

Construction and operation of new LNG projects will create as many as 50,000 new jobs in design, engineering and construction, which translate into hundreds of millions of dollars in new wages for U.S. workers during the construction of the facility.

LNG exports will also lead to additional domestic natural gas production, which will in turn create hundreds of thousands of new jobs in the United States.

The enormous potential for new jobs is a major reason why labor unions have also voiced support for LNG exports. Brad Karbowsky with the United Association of Plumbers, Fitters and HVAC Techs said the following about potential jobs created as a result of LNG exports:

> The billions of dollars in wages generated by these well-paying jobs will be multiplied throughout communities across the country in the form of investment and taxes, which will in turn be used to support schools, fire stations and other essential public services. This new source of shared prosperity will provide a foundation for future growth.

Harry Melander, President of the Minnesota State Building and Construction Trade Council, has also observed:

> Exporting America's abundant natural gas to global markets is yet another excellent opportunity to increase job production and investment as a result of the burgeoning U.S. domestic energy production.

Nor are the benefits all directly related to the LNG industry. As natural gas production has expanded in recent years due to the responsible development of shale, local businesses like hotels and restaurants in production areas have benefitted from a growth in demand for their products and services. Adam Diaz, a small business owner in Susquehanna County, Pa., recently observed:

> In the last three years since the natural gas industry came to Susquehanna County, Pennsylvania, my company has been able to grow from 30 employees to 250, while our revenue has increased from less than $2 million annually to almost $50 million today. This growth has led to an increased tax contribution of almost $3.5 million in federal, state and local taxes. Recently though, drilling rig counts have been falling in my area. LNG exports will increase demand, bring back the rigs and allow businesses like mine to grow and add much needed jobs to local economies to keep them strong.

With LNG exports, U.S. natural gas production will grow even more. That production will create U.S. jobs in support sectors that manufacture steel pipe, equipment, control panels, heavy duty trucks, and cement, in addition to well-paying jobs for welders, pipefitters, cement masons, plumbers, machinery mechanics, pump operators and engineers.

MYTH 6—Exports could lead to competitive disadvantages of U.S. manufacturers in global trade

The price of natural gas in the U.S. will be priced below what competitors will face in Asia, for example, even with U.S. exports. There is a substantial cost to liquefying natural gas and transporting it specialized tankers to distant markets (ranges from $8 billion to $20 billion per project of 2 bcf/d), and that fact means the U.S. domestic price for natural gas will be several dollars per thousand cubic feet lower than the price of natural gas in countries which import our LNG.

Rice University professor Ken Medlock notes in his 2012 LNG Export study that these costs will average $2.92/mcf for liquefaction and $2.15/mcf for transportation to Asia ($5.07/mcf total). Other studies show the cost range to be higher, including the NERA study that has a cost range between $6.30/mcf to $8.39/mcf.

Therefore, according to these studies, U.S. manufacturers would still enjoy a $5/mcf to $8/mcf cost advantage over Asian competitors, even if Asian prices and U.S. LNG delivered prices in Japan equalize. That provides a huge competitive advantage to U.S. manufacturers even with LNG exports from the United States.

MYTH 7—LNG exports will back out the same amount of gas used by manufacturers.

Critics assume a zero-sum game in natural gas markets, where 1 bcf of LNG exports takes exactly 1 bcf in supply away from the manufacturing sector. Those critics assert that supply doesn't increase; there is merely a reallocation of given volume of U.S. gas production. History shows that markets don't work that way. They adjust to increasing demands and gas supply can be expected to increase in response to any increase in demand. Of course, producers will respond to demand growth and changes in gas prices; they will develop more projects and produce more gas.

Critics never mention that there will be more gas production to feed LNG exports and to feed increased gas use by manufacturing. A more realistic view of the world actually takes into account that producers will respond to demand changes—i.e., that the supply curve is very elastic and not completely inelastic as in the zero sum mischaracterization of the critics. As producers increase gas production in response to growing demand, manufacturing use of gas can still increase.

An economically realistic depiction of what the shale gas revolution is all about would yield benefits of exports plus the value of the additional U.S. gas production and growth in manufacturing use. In fact, the discussions about the benefits of manufacturing asserted by critics are misleading because they try to make it appear that the choice is stark between either manufacturing or exports, when the real choice involves whether the U.S. wants to reap the benefits from exports plus more natural gas production plus more manufacturing use of gas.

This is not a zero sum game. The shale gas revolution requires a change in this zero-sum mind-set in which natural gas supplies are fixed or diminishing over time, and in which the policy issue is one of deciding which sector gets what share of an ever-diminishing natural gas resource. As Dr. Daniel Yergin, Vice Chairman of IHS and founder of IHS CERA, explained in his testimony before the House Energy and Commerce Committee's Subcommittee on Energy and Power on February 5, 2013:

> [O]wing to the very large resource base, the market in the U.S. is demand-constrained, rather than supply-constrained. Larger markets—whether they be in electric power, industrial consumption, transportation, or exports—are required to maintain the investment flow into the development of the resources.

It is worth repeating: the natural gas market is not supply constrained as the zero sum mind set argues; it is demand constrained. If additional demand comes, addi-

tional natural gas supply will come along as well. The new shale gas reality is that there is an increasing gas supply available for LNG exports in addition to increasing domestic demand, including power generation, manufacturing and other gas consumers.

MYTH 8—Natural gas deserves special restraints that apply to no other product.

Critics argue that it is better for the economy to export finished products made using natural gas rather than exporting natural gas. Taken to its logical conclusion, that prescription would mean that it is not beneficial to export chemicals or aluminum or any intermediate product that is used by another manufacturer. American automobile makers use considerable materials made from chemicals, plastics and aluminum, so according to the critics' logic, exports of chemicals, plastics and aluminum should be restricted to ensure low U.S. prices of these products for the benefit of automakers or other consumers. The long history of support for free trade by Democrat and Republican administrations would be thrown out with this logic. There is no sound economic rationale for claiming natural gas is a special case requiring laborious study before exports are allowed; nor are chemicals, plastics, lumber, wheat, aluminum, and countless other manufacturing and agricultural products special cases calling out for extensive review and study before their exports are allowed. The U.S. economy would be a net beneficiary from unrestricted LNG exports, just as the U.S. is a net beneficiary of unrestricted exports of chemicals, plastics, and aluminum and countless other products.

Additionally, restraints on LNG exports run afoul of the United States' obligations under WTO and GATT, as well as the long-standing policy of the United States to support exports. As stated in the comments filed with DOE by the Peterson Institute for International Economics:

> If the United States nevertheless does impose restraints [on LNG exports], U.S. actions will certainly be cited in the future by other countries that decide to flout international trade rules and restrict their own exports of natural resources as a means of subsidizing downstream industrial users. What's more, it is likely that countries that are not FTA partners will either retaliate with their own natural resource restrictions or challenge U.S. policies at the WTO.

As General Electric stated in its comments filed with the DOE:

> [D]eclining to approve exports of natural gas would be squarely at odds with the United States' longstanding policy and international trade norms disfavoring export restraints (see GATT Article XI). Indeed the United States has been the vanguard of those challenging such restraints globally. (See US/EU/Mexico Challenge to China's Export Restraints on Raw Materials—WTO DS 394, 395, 398, successfully challenging China's export restraints on certain raw materials).For the United States to now adopt such restrictions itself would fundamentally undermine its own international trade policy, which has served to preserve critical access to raw materials globally.

MYTH 9—No clearly established criteria exist for DOE to apply the public interest standard in permitting applications for LNG exports.

The DOE has provided regulatory clarity as to what constitutes the public interest, establishing a clear standard for future decisions.

For example, in the Kenai LNG case, the DOE concluded: "DOE considers domestic need for the gas and any other issue determined to be appropriate, including whether the arrangement is consistent with DOE's policy of promoting competition in the marketplace . . . " Since then, DOE has added several considerations to the "domestic need," but most appear to flow from the concept that the primary concern is to have enough natural gas to meet the domestic needs of U.S. consumers.

For instance, DOE has added the following considerations, quoting from the Federal Register notice in the Golden Pass Products LLC filing:

> To the extent determined to be relevant or appropriate, these issues [considerations] will include the impact of LNG exports associated with this Application, and the cumulative impact of any other application(s) previously approved, on domestic need for the gas proposed for export, adequacy of domestic natural gas supply, U.S. energy security, and any other issues, including the impact on the U.S. economy (GDP), consumers, and industry, job creation, U.S. balance of trade, international considerations, and whether the arrangement is consistent with DOE's policy of promoting competition in the marketplace by allowing commercial parties to freely negotiate their own trade arrangements.

The record for the various proceedings at DOE overwhelmingly contains evidence that the U.S. has an abundance of natural gas, more than enough to meet growing domestic needs for years to come and allow LNG exports. That evidence is in the form of the factual studies filed in support of the various applications now pending before the DOE.

For further clarification, DOE issued its 1984 Policy Guidelines, which were later amended to include exports, stating:

> [t]he market, not government, should determine the price and other contract terms of imported [or exported] natural gas. The federal government's primary responsibility in authorizing imports [or exports] will be to evaluate the need for the gas and whether the import [or export] arrangement will provide the gas on a competitively priced basis for the duration of the contract while minimizing regulatory impediments to a freely operating market." DOE's three stated responsibilities are: One, "to evaluate the need for the gas″; two, assure that the "arrangement will provide the gas on a competitively priced basis for the duration of the contract″; and three, to "minimiz[e] regulatory impediments to a freely operating market.

As to the need for the gas, borrowing from the Sabine Pass order, there has been "substantial evidence showing an existing and a projected future supply of domestic natural gas sufficient to simultaneously support export and domestic natural gas demand both currently" and over the terms of the projects proposed.

Concerning competitive pricing, there is a very liquid, competitive domestic market for natural gas with a multitude of producers, marketers, sellers, and buyers, thus assuring that the natural gas is competitively priced in the U.S. market.

The third stated responsibility of DOE is to "minimize regulatory impediments to a freely operating market." Such a responsibility certainly cannot mean that any one market determinant, such as price or export volumes, could be used to impede the development of the free market. What it surely means is that applicants that meet the statutory and regulatory requirements should be granted the authorizations to export LNG from the United States without regulatory limitation as to export volumes. The "freely operating market" will then allocate scarce and finite economic resources such as financing and end-use contracts to determine which projects will be built and become operational. For as some projects will likely be built, others may not.

The role of the regulator is to assure a level playing field for all participants and to monitor developments for continued consistency with the public interest, not to be a predictor of future events. DOE's policy to allow a "freely operating market" to function with minimal regulatory impediments directly acknowledges the plain reading of the Natural Gas Act, which gives DOE the tools to respond to market conditions that adversely affect the public interest, not to predict future events during the authorization proceeding for projects with lifespans in excess of 20 years each. Those market conditions are not short-term phenomena such as temporary price increases.

Far from being vague in its regulatory framework, DOE has a clearly defined set of criteria for making its LNG export determinations, with that framework focusing on the domestic need for the natural gas proposed to be exported in order to protect the U.S. consumer.

MYTH 10—DOE's process lacks opportunity for all affected stakeholders and the general public to comment on what constitutes the "public interest."

Once DOE determines that an application is complete, it publishes a notice in the Federal Register informing the public of the opportunity to submit motions to intervene, protest, and/or to comment on the proceedings. The opponents complaining about the lack of opportunity to get involved have been publicly outspoken on the issue of LNG exports since prior to the closing of those public comment periods and have sufficient resources to monitor events and take such action as necessary to protect their interests. They simply chose not to do so.

CONCLUSION

LNG exports would provide the United States with enormous economic benefits—new jobs, new tax revenue, new economic growth and a reduced trade deficit. Better yet, these benefits will not come at the expense of domestic consumers of natural gas, whether they are industrial users or individual households.

Those opposed to LNG exports have employed a series of inaccurate characterizations about LNG and the impacts that would result from allowing exports. As such, I thank the Committee for providing me the opportunity to explain why such claims are myths, and that the overwhelming evidence shows that allowing LNG exports

will be a net benefit to the United States. I respectfully request that the Committee urge DOE to commence issuing export approvals so the U.S. can reap all of the benefits of our natural gas resources.

STATEMENT OF PAUL SANSONE, SANSONE & ASSOCIATES

The 'Shale Gale', a huge expansion of available domestically produced natural gas, is the subject of the hearing. I am writing to provide documentation that the legal and regulatory oversight of the industry was manipulated by apparent fraud to secure exception from environmental regulation (Clean Air Act, and Clean Water Act exemptions), fast track approval for LNG "import" terminals (FERC review not State review), and the right of eminent domain for natural gas pipelines connected to these terminals. Substantial evidence exists that the use of false and misleading information and industry wide racketeering was utilized to allow industry to produce the current oversupply of natural gas and create a political and economic conditions necessary to convert the "stranded assets" of import terminals and pipelines for the export of natural gas. The goal of the apparent fraud and racketeering appears to be a covert effort to convert limited regional natural gas markets into an internationally traded commodity which could be used for speculative investment. The scope and impact of this apparent fraud obligates an immediate investigation, the cessation of any natural gas export permits until the full facts are made public, and the criminal prosecution of those responsible for misleading Congress and the American people.

Please find attached an Issue summary prepared in March of 2011, before the industry was openly calling for the conversion of LNG "import" terminals to "export" facilities. Developers seeking permits for a LNG "import" facility in Oregon (Oregon LNG, Leucadia Corp.) publicly solicited investors for the project promoting "import" permits as a short-cut to more profitable "export" facilities.

Industry projections of domestic natural gas resource size and estimated costs of production have been consistently unreliable. A newly released analysis of the domestic natural gas resource entitled "Drill, Baby, Drill—Can unconventional fuels usher in a new era of energy abundance" by J. David (http://www.postcarbon.org/reports/DBD-report-FINAL.pdf) calls into question the actual size of the domestic natural gas resource.

SUMMARY OF LNG

LNG export fraud—legal and policy options

> We're truly going to go down as the dumbest generation.. It's bad public policy to export natural gas—a cleaner, cheaper domestic resource—and import more expensive, dirtier OPEC oil.[1]

T. Boone Pickens in response to U.S. Dept. of Energy's approval of the first U.S. LNG export terminal

> 1. Summary—Booming U.S. natural gas production from shale gas and the resulting low prices have triggered a wave of now public proposals to export U.S. gas as LNG. The proposed LNG export terminals were all either recently constructed or expanded for the stated purpose of LNG import. While the companies built their core facility infrastructure, such as docks, pipelines and storage tanks, claiming they would increase U.S. gas supplies, these same companies are now moving to use this infrastructure to sell U.S. gas into the high-priced Pacific Rim and European markets. With China's recent announcement that it will increase is natural gas use by over 300 percent in the next five years,[2] China is positioning itself as the most likely purchaser of U.S. LNG pending development of its own shale gas resources. Opening the door to U.S. LNG export would cause a major increase in the price of natural gas for consumers and unprecedented profits for gas producers.

Despite the lack of any rational economic basis for LNG import and Oregon's unique location for LNG export, investors behind two LNG terminals planned for Oregon continue to claim to state and federal regulators, their investors and the public that the Oregon terminals are intended to import LNG. While the Jordan Cove terminal in Coos Bay recently acknowledged it was considering export, its for-

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[1] Natural gas prices set to jump with exports - Pittsburgh Tribune-Review http://www.pittsburghlive.com/x/pittsburghtrib/s__741745.html#ixzz1QOd1TrPm

[2] http://gulfnews.com/business/markets/china-s-natural-gas-push-will-affect-energy-prices-1.829199

mal regulatory filings continue to assert the terminals would be used for LNG import. There is a strong basis, however, to believe that the claims that the Oregon terminals are intended for LNG import are fraudulent and that the planned terminals have long been intended to export expanding Rockies shale gas production to the Asian market.

A review of the five existing U.S. LNG terminals now proposing to export LNG supports that the Oregon projects are following a pattern of intentional deception that involves some of the largest U.S. natural gas producers and pipeline companies when they allege that their terminals are for LNG import.

If true, falsely claiming intended export projects are import projects to investors and government regulators would violate a host of state and federal laws. These range from the federal Securities and Exchange Act and criminal prohibitions against making false statements to federal agencies to violations of Oregon's criminal prohibition against "unsworn falsification" which prohibits providing false information to a state agency in an effort to obtain a "benefit" such as a wetland fill permit or state land lease.[3] Furthermore, providing false information to a state agency under ORS 162.085(1) is a predicate offense under Oregon's Racketeer Influenced and Corrupt Organization Act (ORICO). Oregon Federation of Teachers v. Oregon Taxpayers United, 345 Ore. 1; 189 P.3d 9(2008) (specifically affirming that violations of ORS 162.085(1) qualified as ORICO predicate offenses.

Because of the price impacts on consumers in states near proposed LNG export terminals and the very similar pattern of expansion or development for import followed quickly by a switch to export that has occurred at each of the LNG terminals now proposing export there may be grounds for a coordinated investigation with other states such as New York and Maryland.

In addition to any potential criminal or civil enforcements, there are strong public policy reasons for pressuring the investors pushing LNG terminals in Oregon to stop their false claims that the planned terminals are still intended for LNG import.

2. The national rush to export LNG

The largest gas producers and pipeline companies in the United States are moving to convert at least five of the 11 existing U.S. LNG import terminals into LNG export terminals that would export low-priced U.S. natural gas to the Asian (primarily Chinese) and European markets. The plans come as new drilling technology has opened up a surge in natural gas production that has sent average gas prices in 2009 and 2010 to half of their 2005 levels.[4] Asian LNG prices, however, remain more than 300 percent above U.S. prices[5] and LNG prices in Europe are on the order of 200 percent above U.S. prices.

The price equation has brought U.S. LNG imports to almost a standstill and the Cove Point Maryland LNG terminal in June 2011 even asked FERC to order LNG tankers to deliver LNG to its facility against their will to maintain safety systems that depend on LNG for cooling.[6] In April 2011, Excelerate Energy announced it was completely abandoning the offshore LNG import facility it built in 2005 in the Gulf because of abundant U.S. gas supplies.[7]

In May, 2011, the U.S. Dept. of Energy (DOE) approved Cheniere Energy's plan to export U.S. produced gas as LNG from its Sabine Pass, LA LNG terminal which was permitted and constructed as an LNG import terminal.[8] Cheniere already has a contract to export the U.S. produced LNG to China.[9] The terminal is the world's largest and the project is now pending FERC approval. DOE approved the project despite Cheniere's own study showing that allowing just this one export terminal

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[3] ORS 162.085(1), "(1) A person commits the crime of unsworn falsification if the person knowingly makes any false written statement to a public servant in connection with an application for any benefit." The term "benefit" is broadly defined to mean "gain or advantage to the beneficiary or to a third person pursuant to the desire or consent of the beneficiary." ORS 162.055(1). See Oregon Federation of Teachers v. Oregon Taxpayers United, 345 Ore. 1; 189 P.3d 9(2008)(broadly defining what constitutes a "benefit" under ORS 162.085(1))

[4] U.S. Energy Information Administration (2005 averge wellhead price of $7.33/thousand cubic feet compared to 2009 and 2010 average wellhead prices of $3.67 and $4.16.)

[5] Henry Hub price of June 15, 2011 of $4.52/mmbtu. http://www.neo.ne.gov/statshtml/124.htm; Japanese pre-earthquake LNG prices from January 2011 were $11.96/mmbtu and as of June 2011 had risen to nearly $ 14 mmbtu. Japan's December LNG Import Bill Rises 3.9% on Crude, Bloomberg News By Dinakar Sethuraman - Jan 30, 2011 http://www.bloomberg.com/news/2010-12-29/japan-s-november-lng-import-bill-increases-6-after-crude-oil-prices-gain.html; http://www.asahi.com/english/TKY201106220170.html.

[6] http://www.lngworldnews.com/usa-cove-point-lng-requests-ferc-approval-to-order-lng-imports

[7] http://www.excelerateenergy.com/2011/04/04-13-2011.html

[8] http://www.bloomberg.com/news/2011-05-20/cheniere-surges-45-after-u-s-expands-its-lng-export-approval.html

[9] http://www.pennenergy.com/index/blogs/all-energyall-the-time/blogs/Pennenergy/all-energy-all-the-time/post987__6847736399226820909.html

could result in up to an 11.6 percent increase in the price of U.S. natural gas.[10] This price increase alone would generate more than $10 billion a year in increased revenues for U.S. gas producers based on 2010 gas revenues and would come directly from consumers' pockets.[11] But the potential 11 percent price increase from just one LNG terminal highlights just how much producers would benefit from opening the door to broader LNG export and what is at stake for U.S. consumers.

In a recent Pittsburgh Times article on the potential for LNG export to increase gas prices, the Times reported that if the five already proposed export terminals were approved they could collectively export 13.9 percent of total U.S. gas production[12] and fundamentally change the U.S gas market. But even this is a gross underestimate. If the two proposed Oregon LNG terminals are included, as well as other terminals that will likely soon move to export, the potential export percentage number jumps significantly higher.

The ease at which the United States could feel the pain of LNG exports is highlighted by the fact that a modern large scale QMAX LNG tanker (266,000 cubic meters), which has already docked at the Sabine Pass LNG terminal, can export more than 8.8 percent of total U.S. daily gas production in a single shipment.[13]

Major energy consumers are finally waking up to the reality of how LNG exports would drive a major increase in U.S. gas prices. The Industrial Energy Consumers of America, which represents American manufacturers with annual sales of $800 billion and 750,000 employees, is now fighting Cheniere's Sabine Pass LNG export plans with its saying that the impact on gas prices would be "absolutely frightening."[14] T. Boone Pickens opposed the Cheniere LNG export saying that if the United States approved LNG export we "we're truly going to go down as the dumbest generation.. It's bad public policy to export natural gas—a cleaner, cheaper domestic resource—and import more expensive, dirtier OPEC oil."[15] The American Public Gas Association, which represents 700 public gas companies in 36 states is also opposing LNG export because of the threat to increased prices.[16]

The potential for LNG exports to drain seemingly abundant supplies is not merely hypothetical. Alaskan industrial gas users, consumers and some elected leaders strongly opposed Conoco's plans to extend its FERC permit at its LNG export terminal in Kenai Alaska, which at the time was the only U.S. export terminal. Alaska's largest electric utility even filed suit to challenge the exports saying that the terminal, which exported a third of all locally produced gas, drove up prices and left it without adequate supply to meet local needs.[17] [18] But with the facility nearing the end of its FERC license, Conoco announced in February 2011 it was closing the export facility because it could not obtain sufficient gas supplies to export and meet local needs.[19] Ironically, Conoco (which is now proposing LNG export from its Freeport Texas LNG terminal) also said it was considering converting the Kenai facility into an LNG import terminal.

In a similar example, Indonesia, for which for years was a major LNG exporter, has recently found itself planning its first LNG import terminal as it now faces gas shortages caused by LNG export.[20]

3. Change to U.S. natural gas market

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[10] U.S. DOE Order approving LNG export from Sabine Pass LNG terminal at p. 11, citing Navigant Consulting's Market Analysis for Sabine Pass LNG Export Project (NCI Report) at p. 14. See also Natural gas prices set to jump with exports - Pittsburgh Tribune-Review http://www.pittsburghlive.com/x/pittsburghtrib/s__741745.html#ixzz1QOd1TrPm

[11] Estimate is based on a U.S. EIA 2010 reported marketed NG price of 4.16/ thousand cubic feet and total marketed production of 22,568,863 million cubic feet. http://www.eia.gov/dnav/ng/ng__prod__whv__dcu__nus__a.htm

[12] Natural gas prices set to jump with exports - Pittsburgh Tribune-Review http://www.pittsburghlive.com/x/pittsburghtrib/s__741745.html#ixzz1QOd1TrPm

[13] 1 cubic meter of LNG = 20,631 cubic feet x 266,000 cubic meter LNG (for a QMAX tanker)= 5487846000 cubic feet of natural gas per tanker. 5,487,846,000 cubic feet per tanker/total average daily of 2010 U.S. marketed natural gas production of 61,832,501,370 = 0.08875 = 8.8 % of average daily US marketed natural gas production.

[14] Natural gas prices set to jump with exports - Pittsburgh Tribune-Review http://www.pittsburghlive.com/x/pittsburghtrib/s__741745.html#ixzz1QOd1TrPm

[15] Natural gas prices set to jump with exports - Pittsburgh Tribune-Review http://www.pittsburghlive.com/x/pittsburghtrib/s__741745.html#ixzz1QOd1TrPm

[16] Natural gas prices set to jump with exports - Pittsburgh Tribune-Review http://www.pittsburghlive.com/x/pittsburghtrib/s__741745.html#ixzz1QOd1TrPm

[17] http://www.adn.com/2008/11/09/583470/utility-petitions-to-block-gas.html

[18] http://www.adn.com/2010/07/08/1359592/give-southcentral-priority-on.html; http://www.adn.com/2010/08/14/1410315/parnell-backs-liquefied-natural.html

[19] http://www.adn.com/2011/02/09/1692895/ap-newsbreak-alaska-lng-plant.html

[20] http://www.lngworldnews.com/indonesia-may-import-4-5-mtpa-of-lng-from-2013/

Allowing LNG exports would change the fundamental mechanics of the U.S. natural gas market, which is currently defined by massive new gas discoveries in shale formations, production increases, and low prices. The United States recently outpaced Russia as the World's largest natural gas producer[21] and is by far the largest natural gas consumer using 47 percent more natural gas than Russia, which is the second largest consumer.[22] Globally, the U.S. has the fourth largest proven gas reserves with well over a hundred years of supply and only Russia, Iran and Qatar have larger reserves.[23] Exporting LNG, however, would drive both increased prices and major increases in U.S. gas production that could meaningfully reduce U.S. gas supplies.

4. Investors claim Oregon projects still for LNG import

Despite the fundamentals of the U.S. gas market and agreement from federal, state and private sector experts that there is no justification for new LNG import terminals,[24] the investors pushing the two Oregon LNG terminals continue to tell federal and regulators, investors and the public that their projects are for LNG import. While the proposed Jordan Cove terminal in Coos Bay has recently acknowledged that it is considering LNG export, it continues to formally claim to FERC and the State of Oregon that its terminal is for LNG import. Both companies are relying on the benefits of LNG imports to support that the project is in the "public interest" and entitles them to the powers of eminent domain.

There is a strong basis for believing that such representations are fraudulent and that there is no genuine intent to import LNG. As even the Oregonian recently reported, "Experts say export economics from Oregon are a slam dunk, potentially doubling the price that Canadian and U.S. producers net for their gas domestically."[25]

A number of factors strongly support that the Oregon LNG projects are intended for export. These factors include:

1. The absence of any market rationale for importing LNG given the abundance and low price of U.S. gas and the comparatively high price of global LNG;
2. The high profit margin from exporting low-cost U.S. gas to the nearby Pacific Rim market and the increased revenues that would result from the higher gas prices generally;
3. The new FERC-permitted pipeline infrastructure to the Jordan Cove terminal would create a direct connection from William's Opal Wyoming gas hub to the Coos Bay LNG terminal with at least one company (PG&E Strategic Capital) owning gas capacity on the new Ruby Pipeline (Opal Wyoming to Malin, Oregon) and owning a 1/3rd interest in the Pacific Connector (Malin, OR to Coos Bay);
4. Gas producers have a strong incentive to export abundant Rockies' gas supplies which are driving low Rockies' prices. Williams, which is Wyoming's largest gas producer as well as a major pipeline owner, for example, is the co-owner and lead player in developing the 234-mile Pacific Connector pipeline that would connect the Jordan Cove terminal to the western terminus of the new Ruby Pipeline from Wyoming at Malin, Oregon.[26] [27] The 680-mile nearly completed Ruby Pipeline, in fact, originates at the Opal Hub, which Williams operates and is considered the gas epicenter of the Rockies.[28] Williams is well aware of the need for new export capacity from the Rockies and decreased its Wyoming production by 15 percent in 2009 due to low prices.[29] [30]

While Ruby's owner, El Paso Energy, (which is also large U.S. gas producer (22nd largest in 2009) will clearly benefit from the large California gas market, El Paso is no stranger to LNG and actually owns the Elba Island LNG terminal in Georgia. The terminal is operated by BG Group, which has already proposed LNG exports

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[21] http://www.bloomberg.com/apps/news?pid=newsarchive&sid=aH0jhcEHz07s

[22] http://www.indexmundi.com/energy.aspx?product=gas&graph=consumption

[23] U.S. EIA, 2010.

[24] "Palomar gas partners pull the plug on controversial pipeline proposal," Oregonian, March 23, 2011. http://www.oregonlive.com/business/index.ssf/2011/03/palomar__gas__partners__pull__the.html

[25] http://www.oregonlive.com/business/index.ssf/2011/07/oregon__lng__terminal__plans__reve.htm

[26] http://www.williams.com/midstream/ms__operations.aspx

[27] http://www.pacificconnectorgp.com/overview.php

[28] Ruby Pipeline, Final EIS at p. 1-2.

[29] http://www.investorvillage.com/mbthread.asp?mb=2234&tid=8498013&showall=1

[30] http://www.pacificconnectorgp.com/partners.php; http://www.williams.com/midstream/ms—operations.aspx

from its Lake Charles terminal and there is every reason to expect that LNG export will soon be proposed from El Paso's Elba Island, GA terminal.

4. Oregon terminals are following a familiar path

The Oregon terminals appear to be following a similar path of intentional misrepresentation which has become more obvious as U.S gas supplies have remained high and prices low. A review of each of the five LNG terminals now proposing LNG export shows that these facilities were either constructed or significantly expanded in the last two to three years with the project backers claiming that they would help import low cost LNG into the U.S. market. Completion of construction was soon following by announcement of plans to export.

The bonanza of new shale gas has been well known to gas industry insiders since well before 2003,[31] when even USGS described the Barnett Shale formation in Texas, which was the first mega shale find, as a "giant gas accumulation" and "one of the most significant domestic onshore gas plays."[32] Just as these shale gas formations were spiking production and similarly massive gas reserves were being discovered in the Haynesville shale in east Texas and Louisiana, a group of companies all heavily involved in gas production (Exxon-Mobil, Cheniere, Conoco-Phillips) launched plans for LNG "import" terminals on the Gulf Coast in pipeline-close proximity to the Barnett Shale. Four new terminals in the Gulf were completed between 2008 and 2010, as were major terminal expansions at three existing LNG terminals on the East Coast.

Each project cost on the order of a billion dollars and was built at a time when the then-existing LNG terminals were not even operating at half capacity. Once the projects were completed, these same companies effectively declared their LNG import projects obsolete given the high price of LNG and low cost of U.S. gas and quickly re-positioned to obtain export approval. While an LNG terminal needs to install expensive liquefaction equipment to be converted to LNG export, the roughly $3 billion costs are minimal given the potential price differential between U.S. gas and Pacific Rim LNG prices. Although permit modifications from FERC and U.S. DOE are needed, DOE approved Cheniere's export application within nine months and FERC is moving quickly on the application.[33]

These companies now frame their unique ability to quickly modify their terminals to switch to lucrative LNG export as something they stumbled into as a chance to salvage their expensive investments in LNG import. As Cheniere Energy, which was exclusively a gas producer before proposing the Sabine Pass and Freeport LNG terminals, explained in announcing that the Sabine Pass import terminal would switch to LNG export, "[t]he 853-acre Sabine Pass site is strategically situated to provide export services given its large acreage position, proximity to unconventional gas plays in Louisiana and Texas, and its interconnections with multiple interstate and intrastate pipeline systems."[34] Cheniere further explained that, "the Sabine Pass terminal already has many of the needed facilities for an export terminal. Cheniere would use its existing infrastructure, including five storage tanks and two berths at the Sabine Pass terminal, as well as Cheniere Energy Inc.'s 94-mile Creole Trail Pipeline . . . "[35]

When Dominion Resources, which owns the recently expanded Cove Point Maryland LNG terminal and is a Marcellus shale gas producer, announced it was considering LNG export its Chief Executive made nearly the same comment stating, "If you think about Cove Point, where it sits there in the Mid-Atlantic, a couple hundred miles from the Marcellus region, it has got all the facilities it needs other than the liquefaction itself."[36]

The idea, however, that the world's largest and most sophisticated gas industry players, such as Conoco-Phillips, Sempra, Dominion and Exxon-Mobil, all collectively responded to news of massive new U.S. shale gas discoveries by making catastrophically poor decisions to invest in costly LNG import projects that can now coincidentally be used as the springboard for far more lucrative LNG export projects is strained. While there clearly were assessments supporting the need for new LNG

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[31] Huge natural gas field 'discovered' in Texas, World Net Daily News; November 30, 2005 http://www.wnd.com/?pageId=33642

[32] Richard M. Pollastro, U.S. Geological Survey, Denver, Colorado, Geologic and Production Characteristics Utilized in Assessing the Barnett Shale Continuous (Unconventional) Gas Accumulation, Barnett-Paleozoic Total Petroleum System, Fort Worth Basin, Texas; presented at Barnett Shale Symposium Ellison Miles Geotechnology Institute Brookhaven College, Farmers Branch, Dallas, Texas 2003. On file

[33] Cheniere applied to US DOE in September 2010 and the application was approved in May 2010.

[34] http://www.firstenercastfinancial.com/forums/showthread.php?t=10&page=7

[35] http://www.firstenercastfinancial.com/forums/showthread.php?t=10&page=7

[36] http://uk.reuters.com/article/2011/02/01/lng-dominion-export-idUKN0122810220110201

terminals, there is no question that gas producers were well aware of the unprecedented U.S. shale reserves when they proposed LNG import projects.

From a geographical perspective alone, it is worth noting that the biggest new LNG "import" projects in Freeport, TX (Conoco), Golden Pass, LA(Exxon-Mobil), Sabine Pass, LA(Cheniere Energy),, and Cameron, TX(Sempra) all constructed in the last two to three years, were all built at the close proximity to Texas' Barnett Shale which was the first mega-shale reserves to be "discovered" and commercially produced with Halliburton's fracking technology in the 1990s and early 2000s.

5. Companies acquire shale gas interests while expanding LNG "import" terminals

It is also telling that many of the companies building new LNG "import" terminals or expanding existing terminals were acquiring major interests in U.S. shale gas reserves at the same time they were developing and expanding their nearby LNG terminal infrastructure for the purported purpose of LNG import.[37] For example:

Lake Charles and Elba Island LNG terminals—BG Group(formerly British Gas), spent over $900 million expanding the Elba Island and Lake Charles LNG terminals and constructing new gas pipelines while at the same time acquiring gas production rights for almost a million acres in the Marcellus and Haynesville shale formations.[38] BG Group, which controls almost 50 percent of the total LNG terminal capacity on the East Coast, is now seeking permission to export LNG its Lake Charles terminal.[39] BG Group recently signed a 20-year $70 billion deal in March 2010 to export LNG to the China National Offshore Oil Corp (CNOOC) from Australia and the Chinese are potential purchasers for the Lake Charles LNG as well.[40]

Cove Point Maryland—Statoil (Europe's second largest gas importer) doubled the storage and output capacity of the Cove Point Maryland LNG terminal in 2009, shortly after buying a 32 percent interest in 1.8 million acres of the nearby Marcellus shale in 2008.[41] At the same time Dominion Resources, which owns the Cove Point terminal and is also a Marcellus shale gas producer, expanded the pipeline infrastructure to the terminal.

Cove Point Statoil's deal was with Chesapeake Energy(2nd largest U.S. gas producer) who is a partner in the Cheniere LNG export project and has likely been the most active industry proponent of LNG exports.

Freeport LNG terminal—Conoco-Phillips, the 3rd largest U.S. gas producer and the 50 percent owner and operator of the Freeport LNG terminal, received its first LNG shipment at its new billion dollar LNG import terminal in April 2008, but less than four months later it sought permission to re-export the LNG it had imported.[42]

Golden Pass LNG terminal—Exxon-Mobil, the largest U.S. gas producer, and co-owner of the newly built Golden Pass LNG terminal (which it co-owns with Conoco and Qatar Gas) in Texas received its first LNG shipment in October 2010 with commenters noting that there was no domestic market for the gas.[43] As a part of that project Exxon built a new 69-mile pipeline that connects the facility with Williams' Transco Pipeline system which is near capacity with a flood of new shale gas production.[44] While Exxon-Mobil has thus far denied any interest in exporting, or interesting even re-exporting LNG[45], it globally has significant experience in LNG and is currently building a $15 billion LNG export terminal in Papua New Guinea.[46] Exxon-Mobile has also been aggressively acquiring shale gas producers in the Haynesville Shale (LA/TX) and Marcellus Shale (NY, PA) including its 2009 $41 billion purchase of XTO Energy[47] (3rd largest owner of U.S. gas reserves), Haynesville shale producer Ellora Energy for $695 million in 2010[48], and $1.6 billion for two

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[37] Additional research is needed to better detail the timing of LNG terminal development and shale gas acquisition generally described below which should be considered preliminary.

[38] http://www.reuters.com/article/2010/03/02/lng-elba-expansion-idUSN0215533320100302

[39] http://www.ft.com/cms/s/0/d0443c62-7b26-11e0-9b06-00144feabdc0.html#axzz1SsEVzme7

[40] http://www.nytimes.com/2010/03/25/business/global/25energy.html

[41] http://www.thestreet.com/story/10447133/1/chesapeake-statoil-form-gas-venture.html;http://www.reuters.com/article/2011/02/01/lng-dominion-export-idUSN01228210220110201

[42] http://www.chron.com/disp/story.mpl/headline/biz/5956709.html

[43] http://panews.com/local/x847473509/Golden-Pass-LNG-receives-first-shipment

[44] http://thetimes-tribune.com/news/gas-drilling/marcellus-gas-has-transco-pipeline-almost-at-capacity-1.1118270#axzz1RLZJJwgV

[45] http://www.advfn.com/news___Exxon-CEO-No-Thought-Of-Exporting-LNG-From-US__40756658.html

[46] http://www.bloomberg.com/news/2011-06-01/exxon-mobil-targets-first-papua-new-guinea-lng-cargoes-in-2014.html

[47] http://www.marketwatch.com/story/exxon-mobil-to-buy-xto-energy-in-41-billion-deal-2009-12-14

[48] http://www.denverpost.com/business/ci—16462625

Marcellus Shale producers in 2011.[49] These major acquisitions have made ExxonMobil by far the largest holder of U.S. gas reserves.[50] Its current silence on LNG exports may reflect an effort to minimize attention while the first LNG export terminals from lower visibility companies are being approved.

Cameron LNG terminal and Costa Azul (Baja)—Sempra, which is the largest gas company in the U.S. in terms of coverage area and population, served has said it is considering LNG export from its Cameron LNG terminal in Louisiana and potentially its Costa Azul terminal in Baja.[51] The Cameron terminal was opened in June 2009[52] as an LNG import terminal but within just a year and a half after opening it had received full FERC permission to export LNG.[53]

Kitimat, B.C.—When the Kitimat import terminal was approved in 2006 it's investors claimed, "The Kitimat LNG terminal is designed to meet a supply shortage of natural gas in the North American market."[54] But by November of 2008 Kitimat sought state and federal permission to change the plant from an import to export facility citing the abundant gas supplies in the "worldclass unconventional gas developments in northeastern BC (Horn River and Monterey fields)."[55] Less than two months later, Kitimat had won a permit amendment that authorized the export terminal and announced a deal to sell LNG to Mitsubishi.[56] Kitimat is now co-owned by major shale gas producers Encana (7th largest gas producer), EOG Resources (9th largest U.S. gas producer) and Apache.

6. Laying the foundation to export LNG from shale gas

The gas industry was well aware of the massive potential for new shale gas before 2003.[57] Those interests, in fact, were very visible in the 2005 Energy Policy Act, which was crafted with strong influence from U.S. gas producers working under the Cheney Energy Task Force. The 2005 Act gave major tax breaks for shale gas development and the so-called "Halliburton Loophole," exempted shale gas extraction from the Safe Drinking Water Act.[58] Halliburton is considered the pioneer of the "fracking" technologies needed for shale gas development and by the mid-1990s was highly active in Texas' Barnett Shale.

But the same people promoting special treatment for shale gas were intimately familiar with LNG export. Halliburton subsidiary KBR, for example, has built 40 percent of the world's LNG export terminals[59] and recently won the design contract for the Kitimat LNG export terminal (originally permitted for LNG import) in British Columbia.[60]

There are even signs that those crafting the 2005 Energy Act actively planned to facilitate LNG export. For example, the Act included a condition that for the first time allowed LNG terminal operators obtaining permits before 2015 to use their terminal (import or export) exclusively for natural gas owned by the terminal's operators and with the assurance that FERC was prohibited from, "any regulation of the rates, charges, terms, or conditions of service of the LNG terminal."[61] This opened the door for gas producers to own an LNG terminal to export the gas they owned (or independently contracted for) free from the type of "open access" requirements that FERC had required for LNG terminals (and still does require for gas pipelines) and operate the terminal for maximum profitability. While this would benefit any LNG terminal operator, this special treatment provides a unique incentive for vertically integrated gas producers who are interested in export.

7. Potential criminal and civil violations for misrepresenting export terminals as import terminals

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[49] http://www.haynesvilleplay.com/2011/06/exxon-still-buying-gas.html

[50] U.S. EIA, 2009.

[51] http://www.reuters.com/article/2011/06/07/lng-export-sempra-idUSN079630320110607

[52] http://www.lngpedia.com/2009/06/24/sempra-cameron-lng-terminal-louisiana-gets-its-first-lng-shipment/

[53] http://www.lngworldnews.com/usa-ferc-approves-sempra-to-re-export-lng-from-cameron-terminal/

[54] a100.gov.bc.ca/.../1137189645610—5f08234ed4754316b54f925e36601e44.pdf

[55] a100.gov.bc.ca/.../1226700475492—8e248a8d30d89bba23feaf7f461ca741d9738f8be453.pdf

[56] http://www.nrcan.gc.ca/eneene/sources/natnat/kitimat-eng.php

[57] Richard M. Pollastro, U.S. Geological Survey, Denver, Colorado, Geologic and Production Characteristics Utilized in Assessing the Barnett Shale Continuous (Unconventional) Gas Accumulation, Barnett-Paleozoic Total Petroleum System, Fort Worth Basin, Texas; presented at Barnett Shale Symposium Ellison Miles Geotechnology Institute Brookhaven College, Farmers Branch, Dallas, Texas 2003

[58] http://www.nytimes.com/gwire/2011/05/20/20greenwire-frack-studys-safety-findings-exaggerated-bush-65374.html

[59] http://www.kbr.com/Newsroom/Articles/Features/Did-You-Know/Leading-With-Experience-KBRs-LNG-Firsts/

[60] http://www.lngworldnews.com/canada-apache-eog-award-kitimat-lng-feed-contract-to-kbr/

[61] 15 U.S.C. § 717(b)(e)(3)(b)(ii).

If LNG terminal developers, pipeline companies and gas producers are misrepresenting efforts to develop LNG export infrastructure by falsely claiming to investors, federal and state regulators and the public that they are seeking to develop LNG "import" projects they may be violating a host of state and federal laws. Cooperation with U.S. DOJ would be needed for the investigation of any federal violations and coordination with other states, such as Maryland and New York, could make sense given the particular impacts on these states from nearby export terminals. Because LNG export would likely trigger a major increase in hydraulic fracturing of shale gas in New York City's drinking watershed, where controversy over fracing is already high, New York may be a particularly interested in investigating LNG export-related fraud.

While a more detailed review of potential legal violations would be useful, at least several areas for further consideration and review include:

A. False statements to state regulators

The planned Oregon LNG terminal applicants have applied for a range of state permits, such as wetland fill permits and water right permits. In doing so the applicants have consistently claimed that the "purpose and need" for their projects was LNG import and that the facilities would in fact import LNG. While not sworn statements, Oregon law prohibits false unsworn statements related to obtaining a "benefit" from the state. ORS 162.085(1) states: "(1) A person commits the crime of unsworn falsification if the person knowingly makes any false written statement to a public servant in connection with an application for any benefit."

The term "benefit" is broadly defined to mean "gain or advantage to the beneficiary or to a third person pursuant to the desire or consent of the beneficiary" and would definitely appear to include a water right, wetland fill permit or state land lease. ORS 162.055(1). Oregon's Supreme Court has interpreted the term "benefit" very broadly finding that even annual non-profit charity financial reporting submitted to the Attorney General's office was in effect an application for a "benefit" since the information in the form could lead to withdrawl of an entity's charitable status. Oregon Federation of Teachers v. Oregon Taxpayers United, 345 Ore. 1; 189 P.3d 9(2008). The Court further held that ORS 162.085(1) extended not only to a permit application itself, but any false statements made "in connection" to that application. Id. at 15. Violation of ORS 162.085(1) is a Class B misdemeanor.

Investigation of such a crime would obviously open the door to the subpoena of internal documents related to potential LNG export under ORS 180.073.

B. Oregon's Racketeer Influenced and Corrupt Organization Act

Violating ORS 162.085(1)'s restriction against unsworn falsification is a predicate crime under Oregon's Racketeer Influenced and Corrupt Organization Act (ORICO). ORS 166.715(6)(a)(B). This has been specifically affirmed by the Oregon Supreme Court. Oregon Federation of Teachers v. Oregon Taxpayers United, 345 Ore. 1, 12; 189 P.3d 9(2008). While additional research regarding a potential ORICO action is needed, ORICO's powerful remedial provisions could even allow a court to order a defendant to abandon a permit obtained under fraudulent pretenses. ORS 166.725(1). Furthermore, ORICO's attorney fee recovery provisions under ORS 166.725(14) have obvious practical benefits.

C. False filings with federal regulators

Federal law makes it a crime for any person to "knowingly and willingly" make "any materially false, fictitious or fraudulent statement or misrepresentation" or "falsifies, conceals, or covers up by any trick, scheme, or device a material fact" or "makes or uses any false writing or document knowing the same to contain any materially false, fictitious, or fraudulent statement or entry" to any Agency or department of the United States regarding a matter within its jurisdiction. 18 U.S.C. § 1001(a). Violations are punishable by up to five years in prison. Id. The companies seeking LNG terminals in Oregon have filed a broad spectrum of documents with federal agencies, such Federal Energy Regulatory Commission (FERC) and the U.S. Coast Guard, representing that their LNG terminals are planned and intended for LNG import. The LNG terminal investors now seeking LNG export from the Gulf and East Coast filed similar documents while seeking permits for construction and expansion approvals. To the extent that projects ultimately intended to be LNG export terminals were fraudulently misrepresented to federal regulators as "import" terminals violations of 18 U.S.C. §1001(a) may have occurred. Unlike Oregon law, such false statements are not a federal RICO predicate act.

D. Federal and state securities fraud.

Numerous companies associated with the five LNG terminals now proposing LNG export reported to investors and the Securities and Exchange Commission (SEC) for years that they were pursuing LNG import projects. Leucadia National, which has proposed the Oregon LNG terminal, and Veresen (formerly Fort Chicago), which is

co-owner of the Jordan Cove project, continues to assert that such projects are for LNG import. Verseen, however, in May 2011 first acknowledged in a letter to shareholders it was considering LNG export.[62] To the extent the actual purpose of planned LNG terminals was to facility LNG export, contrary statements to investors and the SEC may have violated the federal Securities and Exchange Act and related statutes. 15 USC § 77(q); 77(w). Securities and Exchange Act violations carry criminal penalties of up to five years and $10,000. 15 USC § 77(x). Potential violations of Oregon's securities statutes should also be considered if applicable. ORS Chapter 59.

E. Violations of the Natural Gas Act's prohibition against market manipulation

Misrepresenting plans for LNG export projects as import projects may violate the Natural Gas Act's prohibition against market manipulation given the potential for export projects to significantly increase domestic natural gas prices. 15 USC § 717(c)1; 18 C.F.R. § (1)(c)(1). This anti-manipulation provision was first passed in the 2005 Energy Policy Act and carries a maximum criminal penalty of five years and $1,000,000 and additional penalties of up to $50,000 a day. 15 USC § 717(t)(1), (2). Civil penalties can be up to $ 1 million a day. 15 USC § 717t-1. To prevail it would presumably be necessary to show a specific intent to use export as a tool to increase natural gas prices.

CONCLUSION

The potential impacts of LNG export are very real and threaten to squander a resource that is both a unique U.S. competitive advantage and offers a chance to reduce U.S. dependency on foreign oil and greenhouse gas emissions. There are opportunities, however, for using the unprecedented price increases and potential supply shortages that would result from export to motivate energy consumers to fight a concerted effort by gas producers to open large scale U.S. gas exports. This effort would be greatly strengthened by the exposure of fraudulent efforts by some of the largest U.S. gas players to build the infrastructure for LNG export terminals under the guise that they would be used for "import."

STATEMENT OF LEE FULLER, VICE PRESIDENT OF GOVERNMENT RELATIONS, INDEPENDENT PETROLEUM ASSOCIATION OF AMERICA

This testimony is submitted to the record for the Senate Energy and Natural Resources Committee hearing examining the role of natural gas in United States' energy policy on behalf of the Independent Petroleum Association of America (IPAA).

IPAA represents thousands of independent oil and natural gas explorers and producers, as well as the service and supply industries that support their efforts, which will be significantly affected by federal action. Independent producers develop 95 percent of American oil and natural gas wells, produce 54 percent of American oil and produce 85 percent of American natural gas. The average independent has been in business for 26 years and employs 12 full-time and three part-time employees. In total, America's onshore independent oil and natural gas producers supported 2.1 million direct jobs in the United States in 2010.

American natural gas presents an opportunity for the United States to utilize a clean burning, secure and affordable fuel. Projections suggest that identified resources could provide enough natural gas to meet America's needs based on current demand for as much as 100 years. This abundance allows the opportunity for the American economy to utilize natural gas in new ways—an expansion of US chemical production, greater use of natural gas for electricity generation, natural gas vehicle development and exports of liquefied natural gas. The federal government can enhance or impede the development of American natural gas. Two areas that can have substantial impact are the regulatory framework for new production and tax policies that affect the capital essential to meeting future American natural gas demand. This testimony will address these issues.

Regulation of Hydraulic Fracturing

The notion that oil and natural gas production generally, and hydraulic fracturing in particular, are unregulated flies in the face of reality. The allegation that oil and natural gas production is unregulated ignores the long, successful history of state-based regulation of natural gas production. Drilling permitting is grounded in state regulatory systems because it involves state land use authority; the federal govern-

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[62] Veresen May 12, 2011 Media release. http://veresen.mediaroom.com/index.php?s=5043&item=38956

ment has never—nor should it ever—determine the use of lands properly governed by state jurisdictions.

Hydraulic fracturing has been used as a well stimulation technology since the late 1940s for oil, natural gas, geothermal and water wells that is regulated as a part of the drilling permits issued by state regulators. Over the past decade, the combination of horizontal drilling and hydraulic fracturing has allowed industry to produce oil and natural gas from shale and tight sands that, previously, was uneconomic to produce.

Hydraulic fracturing refers to one, temporal step in the oil and natural gas production process. The term hydraulic fracturing has been misconstrued to mean anything related to oil and natural gas development. To be clear, when industry references "hydraulic fracturing," the industry is referencing the step in the oil and natural gas development process that uses water, sand and additives to break apart the hydrocarbon bearing formation (i.e. shale) to create permeability and release oil and natural gas.

Regulation of oil and natural gas production depends, largely, on where the oil and natural gas production is taking place. The federal government has permitting and regulatory authority over production in the Outer Continental Shelf (OCS) and on federally managed lands. These regulations are frequently updated. The Bureau of Land Management, for example, is currently in the process of promulgating new regulations entitled, "Oil and Gas; Well Stimulation, Including Hydraulic Fracturing, on Federal and Indian Lands."

Natural gas and oil production on state and private lands are, generally, regulated by state regulatory authorities. The proximity state oil and gas regulators to the operations occurring in their respective states, combined with the regulators' understanding of the unique circumstances in their states, creates the most efficient system create for environmentally responsible oil and natural gas development. Additionally, state regulators generally have the technical expertise, resources and capabilities to manage the permitting process.

State oil and gas regulators, for example, have successfully regulated the process of hydraulic fracturing for decades. Fracturing regulations were developed and have been implemented by state oil and natural gas regulatory agencies through well construction and completion requirements. These regulations have effectively managed the limited environmental risks of the fracturing process. Over the 60 plus years since the earliest use of hydraulic fracturing, there have been no incidents related to the fracturing process that suggests the existence of a systemic environmental management problem.

Responsible, common-sense regulations on development are a foundation of the oil and natural gas industry's operations—and rightly so. Protecting the environment and developing our resources must go hand-in-hand. Today, the oil and natural gas industry is regulated by both state and federal environmental agencies. However, uniform federal standards that usurp longstanding, state regulatory authority are not the answer. In fact, most federal environmental laws create a broad, overarching federal framework that delegates to the states the responsibility of creating the specific regulations—regulations that reflect the realities that circumstances differ in each state are require different approaches.

These federal environmental laws apply regardless of whether natural gas and oil production are occurring on federal, state or private lands. Moreover, because most federal environmental laws are drafted using a manufacturing facility as a model for the regulatory framework, these laws have provisions that reflect industries that do not fit that model including forestry, agriculture, mining and oil and natural gas production. Uniformity is simply a flawed concept for regulation. Examples of environmental laws adopting a broad framework but delegating implementation to state regulatory agencies, including the Clean Air Act, Clean Water Act, Safe Drinking Water Act and others. IPAA has enclosed legal analysis of applicable federal environmental laws to the upstream oil and natural gas industry.

Despite the numerous federal and state regulations applicable to the oil and natural gas production process, fossil fuel opponents frequently posit the need to create federal, baseline regulations for hydraulic fracturing without any evidence that the current regulatory approach is inadequate.

To the contrary, federal officials, state regulators, and independent experts have publicly stated that shale development—including hydraulic fracturing—does not pose "substantial" risks.

- Interior Secretary Ken Salazar: Responding to what he deemed "hysteria" about hydraulic fracturing, Salazar said the process "can be done safely and has been done safely hundreds of thousands of times." (Feb. 2012)

- EPA Administrator Lisa Jackson: "In no case have we made a definitive determination that the [fracturing] process has caused chemicals to enter groundwater." (April 2012) Jackson also has said: "I'm not aware of any proven case where [hydraulic fracturing] itself has affected water." (May 2011)
- U.S. EPA: "EPA did not find confirmed evidence that drinking water wells have been contaminated by hydraulic fracturing fluid injection . . . " (2004)
- Former EPA Administrator Carol Browner: "There is no evidence that the hydraulic fracturing at issue has resulted in any contamination or endangerment of underground sources of drinking water." (May 1995)
- U.S. Dept. of Energy and Ground Water Protection Council: "[B]ased on over sixty years of practical application and a lack of evidence to the contrary, there is nothing to indicate that when coupled with appropriate well construction; the practice of hydraulic fracturing in deep formations endangers ground water. There is also a lack of demonstrated evidence that hydraulic fracturing conducted in many shallower formations presents a substantial risk of endangerment to ground water." (May 2009)
- CardnoEntrix (Inglewood Oil Field Study): "Before-and-after monitoring of groundwater quality in monitor wells did not show impacts from high-volume hydraulic fracturing and high-rate gravel packing." (October 2012)
- Center for Rural Pennsylvania: "[S]tatistical analyses of post-drilling versus pre-drilling water chemistry did not suggest major influences from gas well drilling or hydrofracturing (fracking) on nearby water wells . . . " (Oct. 2011)
- John Hanger, Former Pa. DEP Secretary: "We've never had one case of fracking fluid going down the gas well and coming back up and contaminating someone's water well." (2012)
- Dr. Stephen Holditch, Department of Petroleum Engineering, Texas A&M University; member of Natural Gas Subcommittee of the Secretary of Energy Advisory Board: "I have been working in hydraulic fracturing for 40+ years and there is absolutely no evidence hydraulic fractures can grow from miles below the surface to the fresh water aquifers." (October 2011)
- Dr. Mark Zoback, Professor of Geophysics, Stanford University: "Fracturing fluids have not contaminated any water supply and with that much distance to an aquifer, it is very unlikely they could." (August 2011)

Despite this consistent experience showing effective regulation, the Obama Administration has sought to encroach upon the progress of even state and private land development through instructions to virtually every agency to find opportunities to federalize the regulation of oil and natural gas production, particularly hydraulic fracturing—the very technology that has unlocked the oil and natural gas reserves from shale. In the spring of 2012, there were no less than 11 federal agencies trying to find ways to regulation hydraulic fracturing. Since there has been no evidence of hydraulic fracturing contaminating groundwater or suggestions that systemic regulatory failure exists in the current regulatory framework, IPAA would encourage Members of the Committee to oppose any new federal regulations on the oil and natural gas industry to allow America's oil and natural gas producers to create jobs and the energy to power the American economy.

Tax Policy

Federal tax policy has historically played a substantial role in developing America's natural gas and petroleum. Early on, after the creation of the federal income tax, the treatment of costs associated with the exploration and development of this critical national resource helped attract capital and retain it in this inherently capital intensive and risky business. Allowing the expensing of intangible drilling and development costs and percentage depletion rates of 27.5 percent are examples of such policy decisions that resulted in the United States extensive development of its petroleum.

But, the converse is equally true. By 1969, the depletion rate was reduced and later eliminated for all producers except independents. However, even for independents, the rate was dropped to 15 percent and allowed for only the first 1000 barrels per day of petroleum produced. A higher rate is allowed for marginal wells which increases as the petroleum price drops, but even this is constrained—in the underlying code—by net income limitations and net taxable income limits. In the Windfall Profits Tax, federal tax policy extracted some $44 billion from the industry that could have otherwise been invested in more production. Then, in 1986 as the industry was trying to recover from the last long petroleum price drop before the 1998-99 crisis, federal tax policy was changed to create the Alternative Minimum Tax that sucked millions more dollars from the exploration and production of petroleum and natural gas. These changes have discouraged capital from flowing toward this industry.

Independent producers historically reinvest over 100 percent of American oil and natural gas cash flow back into new American production.

The Obama Administration's budget request—and recurring advocacy statements on an almost daily basis—would strip essential capital from new American natural gas and oil investment by radically raising taxes on American production. American natural gas and oil production would be reduced. It runs counter to the Administration's clean energy and energy security objectives. The following is a review of some of the Obama Administration proposed changes to natural gas and oil taxation.

Intangible Drilling and Development Costs (IDC)—Expensing IDC has been part of the tax code since 1913. IDC generally include any cost incurred that has no salvage value and is necessary for the drilling of wells or the preparation of wells for the production of natural gas or oil. Only independent producers can fully expense IDC on American production. Loss of IDC for independent producers will have significant effects on their capital development budgets. A Raymond James analysis in 2009 reported that the loss of IDC would result in capital drilling budgets being reduced by 25 to 30 percent. This compares with information provided to IPAA by its members indicating that drilling budgets would be cut by 25 to 40 percent. Regardless of the exactness of the assessments, clearly, the consequences would be significant. And, the consequences would soon be evident. Roughly half of America's current natural gas production is provided by wells developed during the past four years.

Percentage Depletion—All natural resources minerals are eligible for a percentage depletion income tax deduction. Percentage depletion for natural gas and oil has been in the tax code since 1926 after Congress determined that relying solely on cost depletion was leading to the loss of important American mineral resources. Unlike percentage depletion for all other resources, natural gas and oil percentage depletion is highly limited. It is available only for American production, only available to independent producers and for royalty owners, only available for the first 1000 barrels per day (6000 mcfd of natural gas) of production, limited to the net income of a property and limited to 65 percent of the producer's net income. Percentage depletion provides capital primarily for smaller independents and is particularly important for marginal well operators. These wells—that account for 20 percent of American oil and 12-13 percent of American natural gas—are the most vulnerable economically. Input to IPAA from its operators who take percentage depletion indicates that the combined effect of the Obama Administration proposals on IDC and percentage depletion would reduce drilling budgets in half. At this lower rate, new production will not offset the natural decline in production from existing wells. For example, one producer now drills ten wells per year; without IDC and percentage depletion, this producer could only drill five wells per year. A five well program will not replace declining production in existing wells and the small business company will have to shutdown. Congress' choice is straightforward: reduce American oil production by 20 percent and its natural gas production by 12 percent or retain the current historic tax policies that have encouraged American production.

Passive Loss Exception for Working Interests in Oil and Gas Properties—The Tax Reform Act of 1986 divided investment income/expense into two baskets—active and passive. The Tax Reform Act exempted working interests in natural gas and oil from being part of the passive income basket and, if a loss resulted (from expenditures for drilling wells), it was deemed to be an active loss that could be used to offset active income as long as the investor's liabilities were not limited. Natural gas and oil development require large sums of capital and producers frequently join together to diversify risk. Additionally, natural gas and oil operators have sought individual investors to contribute capital and share the risk of drilling wells. Most American wells today are drilled by small and independent companies, many of which depend on individual investors. There is no sound reason for Congress to enact tax rules that would discourage individual investors from continuing to participate in this system. Moreover, Congress applied the passive loss rules only to individuals and not to corporations. The repeal of the working interest rule, therefore, would senselessly drive natural gas and oil investments away from individuals and toward corporations. There is no apparent reason why Congress would or should favor corporate ownership over individual ownership of working interests. Furthermore, since AMT restrictions apply to IDC of individual working interest investors, the application of the passive loss rules to those investors is unnecessary and excessive. In sum, to qualify for the exception, the taxpayer must have liability exposure and definitely be at risk for any losses. If income/loss, arising from natural gas and oil working interests, is treated as passive income/loss, the primary income tax incentive for taxpayers to risk an investment in natural gas and oil development would be significantly diminished. In today's banking climate, smaller producers find banks uninterested or incapable of providing capital; taking private investors

away will further exacerbate the challenge of raising capital to sustain American marginal well production.

Geological and Geophysical (G&G) Amortization—G&G costs are associated with developing new American natural gas and oil resources. For decades, they were expensed until a tax court case concluded that they should be amortized over the life of the well. After years of consideration and constrained by budget impacts, in 2005, Congress set the amortization period at two years. It also simplified G&G amortization by applying the two year amortization to failed as well as successful wells; previously, failed wells could be expensed. Later, Congress extended the amortization period to five years for large major integrated oil companies and then extended the period to seven years. Early recovery of G&G costs allows for more investment in finding new resources. Congress recognized that America benefitted if capital used to explore for new natural gas and oil could be quickly reinvested in more exploration or production of American resources, it was in the national interest. Nothing has changed to alter that conclusion. If anything, current capital and credit limitations enhance the rationale to get these funds back into new investment.

Marginal Well Tax Credit—This countercyclical tax credit was recommended by the National Petroleum Council in 1994 to create a safety net for marginal wells during periods of low prices. These wells as stated above account for 20 percent of American oil and 12 percent of American natural gas. They are the most vulnerable to shutting down forever when prices fall to low levels. Congress enacted in this countercyclical tax credit in 2004 after ten years of consideration. It concluded that the nation benefitted if these marginal operations were supported during times of low prices, that the production from these wells were—in effect—a national resource reserve that would be lost forever if the wells had to be shutdown and plugged during difficult economic times. No different conclusion is now warranted. A year ago, as America faced high energy prices, the clear risk of foreign energy dependency was all too evident; America's marginal wells are a first defense against more foreign imports. Fortunately, to date, the marginal well tax credit has not been needed, but it remains a key element of support for American production—and American energy security.

Enhanced Oil Recovery (EOR) Tax Credit—The EOR credit is designed to encourage oil production using costly technologies that are required after a well passes through its initial phase of production. Conventional oil well production declines regularly after it begins production. However, millions of barrels of oil remain in formations when the initial production phase is over. The 2001 National Energy Report indicated that "anywhere from 30 to 70 percent of oil, and 10 to 20 percent of natural gas, is not recovered in field development. It is estimated that enhanced oil recovery projects, including development of new recovery techniques, could add about 60 billion barrels of oil nationwide through increased use of existing fields." For example, one of the technologies is the use of carbon dioxide as an injectant. In 2006, the Department of Energy studied the potential for using carbon dioxide enhanced oil recovery (CO_2-EOR) and concluded that: "Ten basin-oriented assessments- four new, three updated and three previously released- estimate that 89 billion barrels of additional oil from currently 'stranded' oil resources in ten U.S. regions could be technically recoverable by applying state-of-the-art CO_2-EOR technologies." Given the increased interest in carbon capture and sequestration, CO_2-EOR offers the potential to sequester the carbon dioxide while increasing American oil production. Currently, the oil price threshold for the EOR tax credit has been exceeded and the oil value is considered adequate to justify the EOR efforts. However, at lower prices EOR becomes uneconomic and these costly wells would be shutdown. The EOR tax credit was enacted in 1990 and provides the potential to maintain important US oil production by supporting the development of these wells in low price periods.

The Administration justifies its proposals based on two flawed rationales. First, the provision " . . . like other oil and gas preferences the Administration proposes to repeal, distorts markets by encouraging more investment in the oil and gas industry than would occur under a neutral system." Second, to the extent that the provision " . . . encourages overproduction of oil, it is detrimental to long-term energy security and is also inconsistent with the Administration's policy of reducing carbon emissions and encouraging the use of renewable energy sources through a cap-and-trade program."

The first issue neither is unique to natural gas and oil tax provisions nor to the tax code generally. For natural gas and oil production, these tax provisions are intended to encourage the development of American resources; they were never intended to be neutral. More broadly, these provisions reflect business tax policy that is consistent with comparable treatment of other energy sources. In its report, *Federal Financial Interventions and Subsidies in Energy Markets 2007*, the Energy Information Administration (EIA) assesses the federal government's support for energy sources. As the following tables show, EIA demonstrates that natural gas and oil federal treatment is comparable to other major energy sources on a total basis and is well below other sources on a unit basis. The Obama Administration's first justification is simply an inaccurate characterization of the nature of federal energy tax policies that have been crafted over decades by the Congress.

Beneficiary	Direct Expenditures	Tax Expenditures	Research & Development	Federal Electricity Support	Total
2007 Subsidies					
Coal	-	290	574	69	932
Refined Coal[1]	-	2,370	-	-	2,370
Natural Gas and Petroleum Liquids	-	2,090	39	20	2,149
Nuclear	-	199	922	146	1,267
Renewables	5	3,970	727	173	4,875
Electricity (Not fuel specific)	-	735	140	360	1,235
End Use	2,290	120	418	-	2,828
Conservation	256	670	-	-	926
Total	2,550	10,444	2,819	767	16,581

Table 36. Energy Subsidies Not Related to Electricity Production: Alternative Measures

Category	Fuel Consumption (quadrillion Btu)	Alternative Measures of Subsidy and Support: FY 2007 Subsidy and Support (million 2007 dollars)	Alternative Measures of Subsidy and Support: Subsidy per million Btu (2007 dollars)
Coal	1.93	79	0.04
Refined Coal	0.18	214	1.36
Natural Gas and Petroleum Liquids	55.78	1,921	0.03
Ethanol/Biodiesel	0.57	3,245	5.72
Geothermal	0.04	1	0.02
Solar	0.07	184	2.82
Other Renewables	2.56	360	0.14
Hydrogen	*	230	NM
Total Fuel Specific	60.66	6,237	0.10
Total Non-Fuel Specific	NM	3,597	NM
Total End-Use and Non-Electric Energy	NM	9,834	NM

Table 35. Subsidies and Support to Electricity Production: Alternative Measures

Fuel/End Use	FY 2007 Net Generation (billion kilowatthours)	Alternative Measures of Subsidy and Support: Subsidy and Support Value 2007 (million dollars)	Alternative Measures of Subsidy and Support: Subsidy and Support Per unit of Production (dollars megawatthours)
Coal	1,846	854	0.44
Refined Coal	72	2,156	29.91
Natural Gas and Petroleum Liquids	910	227	0.25
Nuclear	794	1,267	1.59
Biomass (and Biofuels)	40	36	0.89
Geothermal	15	14	0.92
Hydroelectric	258	172	0.67
Solar	*	14	24.34
Wind	31	724	23.37
Landfill Gas	6	8	1.37
Municipal Solid Waste	*	1	0.13
Unallocated Renewables	NM	37	NM
Renewables, subtotal	360	1,008	2.80
Transmission and Distribution	NM	1,235	NM
Total	4,091	5,727	1.65

The Administration's second rationale is similarly irrational. Production of American oil and natural gas serves the nation's goal of improving its energy security. Production of American oil and natural gas has been regulated to assure that wells are limited to volumes that conserve the long term production of its reservoir. These limitations have been entrenched since the mid-1930s. Current production reflects the need for American production to be maximized and nothing suggests that it should not be. Similarly, the Administration's climate goals of reducing carbon emissions and encouraging the use of renewable energy sources are enhanced by American natural gas and oil production. Natural gas is a clean, abundant, affordable and American resource that must be a part of any climate initiative. Oil will continue to be a key component of America's energy supply for the foreseeable future and any policies should rely first on American oil rather than foreign sources.

Conclusion

As the Committee considers policies related to America's natural gas resources, it must recognize that federal actions can dramatically affect the future of the nation's energy security and the nation's ability to meet the potential for its economic growth. IPAA urges the Committee to support those actions that enhance that fu-

ture and reject the ill-advised calls for adverse restrictions to capital and unnecessary federal regulation of production.

ENCLOSURES—TOXIC RELEASE INVENTORY

The federal Emergency Planning and Community Right-to-Know Act (EPCRA)[1] was enacted by Congress as Title III to the Superfund Amendments and Reauthorization Act of 1986. Adopted in response to several highly-visible chemical incidents, EPCRA primarily addresses two key issues: (1) support for emergency planning to respond to chemical accidents, and (2) "provid[ing] the public with important information on hazardous chemicals in their communities."[2] In order to achieve its first goal, EPCRA sets up a broad, comprehensive framework for emergency planning at the state and local levels. For example, EPCRA requires that owners or operators of facilities at which hazardous chemicals are present to provide information contained in the Material Safety Data Sheets (MSDSs) for these chemicals to various state and local authorities. These MSDSs provide a variety of information concerning chemical products, including information on product composition, the physical and chemical properties of the product, potential health hazards and toxicity information, and first aid information and other steps to take in the event of a spill of the product. Addressing its second goal, EPCRA specifically focuses on major chemical and other industrial facilities—those categorized as falling within Standard Industrial Classification (SIC) Codes 20 to 39 (covering only manufacturing operations such as chemical manufacturing, automobile manufacturing, etc.)—and requires these facilities to report annually to the U.S. Environmental Protection Agency (EPA) regarding various releases of specified hazardous chemicals, a form of reporting that is commonly referred to as "Toxic Release Inventory" or "TRI" reporting.

EPCRA was specifically enacted in response to the tragic incident in Bhopal, India and to domestic chemical release incidents such as one that had occurred in Institute, West Virginia. These incidents resulted from the atmospheric release of chemicals from large chemical manufacturing plants into the surrounding community, raising concerns about the risks posed by these releases from large industrial facilities.[3] Based on these incidents, in enacting the TRI provisions in Section 313 of EPCRA[4] Congress specifically focused on the types of facilities that created these risks—large chemical production plants and other types of concentrated industrial operations using significant volumes of hazardous chemicals, particularly where the facilities are located in urban environments or other population centers. Given this approach, Congress limited the EPCRA Section 313 reporting requirements only to those facilities that have the equivalent of at least 10 full-time employees, are classified as being in an industry that has an SIC Code of 20 to 39 (i.e., most manufacturing facilities), and have manufactured, imported or processed more than 25,000 pounds of any covered toxic chemical or "otherwise used" more than 10,000 pounds of any such chemical.

CONGRESS DID NOT INTEND TO REGULATE OIL AND NATURAL GAS EXPLORATION AND PRODUCTION UNDER THE TRI PROGRAM

Congress made a conscious decision in enacting the TRI provisions of EPCRA in 1986 to focus on the types of large manufacturing facilities that were believed to be creating risks to individuals who live in the neighborhoods in the vicinity of such facilities. In adopting this approach, Congress chose not to impose TRI reporting requirements on a wide range of other types of commercial and industrial operations, including but certainly not limited to facilities involved in the exploration and production of oil and natural gas. For example, residential and commercial construction, transportation services, and agricultural operations as well as other types of decentralized operations were also specifically excluded from the scope of the TRI reporting requirements as a result of the congressional deliberations.

Oil and natural gas exploration and production operations in particular differ in key respects from the types of manufacturing operations on which Congress chose to impose TRI reporting obligations. The industrial operations covered by SIC Codes 20-39 which were made subject to TRI reporting—including not only chemical manufacturers themselves but also manufacturing operations that use chemicals, such as motor vehicle, ship, railroad car and aircraft manufacturers, manufacturers of

[1] 42 U.S.C. §§ 11001-11050.
[2] H. R. Rep. No. 99-962 at 281 (1986), reprinted in 1986 U.S.C.C.A.N. 3276, 3374.
[3] See, e.g., 132 Cong. Rec. H9595 (Oct. 8, 1986) (statement of Rep. Edgar) ("my concerns rest with the families that live in the shadow of these chemical and manufacturing plants").
[4] 42 U.S.C. § 11023.

electronics and other types of consumer products and industrial equipment, manufacturers of materials such as steel, plastics and cement and even manufacturers of clothing—typically involve manufacturing processes in large, centralized facilities. These facilities often use or produce significant quantities of chemicals on a consistent, long-term basis and consequently store substantial quantities of chemicals as a routine matter. At the same time, these manufacturing facilities are often located in urbanized environments with many residences surrounding or in close proximity to the manufacturing plant. It was these specific types of circumstances, for example, that resulted in thousands of nearby residents being exposed to the chemicals accidentally released from the chemical manufacturing facility in Bhopal.

In contrast to these concentrated manufacturing operations, oil and natural gas exploration and production facilities are generally widely scattered. Well pads are spread out through many areas of the country, with hundreds or thousands of feet separating individual well pads even in those areas with substantial exploration and production activity. In addition, these facilities are generally found in rural environments, with few if any individuals residing in the vicinity of a well pad itself. In fact, many well pads are located in isolated areas far from any residential areas. At the same time, the operations at an individual well pad typically use very limited amounts of chemicals and many uses of chemicals—such as for hydraulic fracturing and other stimulation operations—are indeed very short-term. As a result operations at individual well pads do not at all create the types of significant risks associated with the use of chemicals that are specifically posed by large manufacturing operations. Consequently, there is no indication that Congress ever intended that highly decentralized operations such as oil and natural gas exploration and production facilities were to be subject to TRI reporting requirements.

Moreover, when it first enacted EPCRA Congress gave EPA the authority to revisit the scope of the TRI reporting when necessary and to add to the categories of facilities that must file TRI reports if the Agency deemed it appropriate. Nevertheless, even when EPA subsequently decided to expand the scope of the types of facilities that must comply with TRI reporting obligations, the Agency again decided not to include oil and natural gas exploration and production facilities within the scope of this program. In exercising its authority, EPA added categories of facilities only when it found that these plants engaged in types of activities which are similar to or related to the activities conducted at the facilities within the manufacturing sector.

Consistent with this congressionally-directed approach, EPA has only added through the years such categories as petroleum bulk terminals, wholesaling of chemicals and related products, metal mining, facilities engaged in the processing (but not the extraction) of coal, solvent recovery services and hazardous waste treatment facilities to the industry sectors required to submit TRI reports;[5] however, EPA has specifically rejected adding oil and natural gas exploration and production facilities to the list of industry sectors required to comply with TRI reporting requirements. In justifying this action, EPA stated that "[t]his industry group is unique in that it may have related activities located over significantly large geographic areas."[6] EPA even noted that for individual well sites, operations probably would not have exceeded the thresholds established in the Act with respect to the minimum number of employees a particular facility must have and the amounts of chemicals it must use in order to be subject to the TRI requirements in the first place. Thus, EPA found no compelling need to require oil and natural gas exploration and production facilities to submit TRI reports, and in fact identified significant concerns that might have arisen if it had decided otherwise.

TRI REPORTING WOULD BE BURDENSOME FOR OIL AND NATURAL GAS EXPLORATION AND PRODUCTION FACILITIES AND WOULD NOT YIELD SIGNIFICANT BENEFITS

If oil and natural gas exploration and production facilities were to be subject to TRI reporting, such requirements would be unnecessarily burdensome, the usefulness of the data generated by such reporting would not justify the costs and those costs, taken together with other regulatory burdens, would severely affect the production of American oil and natural gas.

According to its recent analysis of reporting burdens associated with TRI reporting, the Agency has estimated that facilities that are subject to TRI reporting will spend an average of 48 man hours and over $2400 for each "Form R" report that

[5] See 62 Fed. Reg. 23834 (May 1, 1997).
[6] 61 Fed. Reg. 33588, 33592 (June 27, 1996).

must be submitted to EPA.[7] Imposing these types of reporting burdens on operations at individual well sites could result in substantial cumulative burdens for well operators, many of whom would have to prepare dozens or even hundreds of such reports (if they were eventually subjected to these reporting obligations) because of the number of individual wells they operate and the highly decentralized nature of the operations. These burdens would in turn substantially impede the ability of oil and natural gas operators to produce adequate supplies of American energy at affordable prices. Moreover, these reports would only provide minimal benefit in light of the fact the fact that few if any residents would ever be exposed to any releases of chemicals from many well sites.

At the same time, the imposition of such reporting requirements on oil and natural gas exploration and production facilities could also place substantial administrative burdens on EPA itself and on the TRI program generally. EPA currently estimates that approximately 30,000 facilities throughout the country are subject to TRI reporting requirements and will file a total of about 77,000 reporting forms.[8] In contrast, there are over 933,000 operating well sites across the country—if any significant portion of these well sites were to become subject to TRI reporting, it would obviously result in a dramatic increase in the number of reports submitted to the Agency and could potentially overwhelm the system with information about facilities that pose little risk of the type that EPCRA was designed to address in the first place, thereby undermining EPA's ability to focus its attention and resources on the types of facilities that Congress actually intended to cover—those that pose a potential risk to significant populations.

CONCLUSION

In short, Congress intended EPCRA to meet two principal objectives—namely, first to provide chemical information for emergency planning and response to key state and local governmental agencies, and second to focus on large centralized manufacturing operations and facilities to obtain information on releases to the environment. Oil and natural gas exploration and production activities differ from those types of manufacturing operations that are subject to TRI reporting obligations in several key respects. First, in contrast to these manufacturing facilities, oil and natural gas exploration operations are widely scattered and relatively small in scale. Moreover, these operations are generally not undertaken near large, urban centers in the U.S. Thus, the decision of Congress not to include oil and natural gas exploration and production activities within the universe of facilities subject to TRI requirements was wholly consistent with congressional intent. Indeed, many other commercial and industrial sectors were likewise excluded from TRI coverage. In addition, EPA has chosen not to add oil and natural gas exploration and production activities to the universe of facilities required to comply with TRI reporting obligations because there is no compelling reason to impose new reporting burdens that would provide no significant benefit and that would only serve to drive up the cost of oil and natural gas production.

ENCLOSURE—CLEAN WATER ACT

Congress passed the Federal Water Pollution Control Act Amendments of 1972 to address pollution of the nation's rivers, lakes, streams and ocean waters, with the ultimate goal of eliminating all discharges of pollutants into those waters.[1] Commonly referred to as the federal Clean Water Act (CWA), this federal water pollution law is aimed at achieving the national goal of making our nation's waters safe for swimming and fishing. To achieve these objectives, the CWA regulates the discharges of pollutants into the "waters of the United States" from municipal, industrial and other sources (e.g., persons filling wetlands or concentrated animal feeding operations such as feedlots). The Act also includes provisions that are designed to prevent spills of oil and hazardous substances from entering and contaminating national waterways and that assign liability for cleaning up spills that do occur.

As a key part of this overall framework, the CWA authorized the implementation of the National Pollutant Discharge Elimination System (NPDES) program, which established a system for the issuance of permits to control discharges of pollutants into the navigable waters and their tributaries from wastewater treatment plants, industrial facilities and other "point sources." These permits establish limits on the amounts of pollutants that a facility may have in the wastewater it discharges to

[7] EPA, Toxic Release Inventory, TRI Form R Toxic Chemical Release Reporting, Information Collection Request Supporting Statement, EPA ICR No. 1363.15 at 24 (Dec. 10, 2007

[8] ICR Supporting Statement at 41.

[1] 33 U.S.C. §§ 1251–1387.

a stream, river, lake or other regulated surface water and set forth permit conditions that require monitoring of discharges and reporting to the appropriate permitting authority. The authority to issue these NPDES permits has largely been delegated to the states, most of which have developed their own wastewater discharge permitting programs.

At the same time, the CWA established a system for addressing spills of oil and hazardous substances that is largely implemented by the federal government through the U.S. Environmental Protection Agency (EPA) and other agencies such as the U.S. Coast Guard. The CWA prohibits the discharge of harmful quantities of oil or hazardous substances into or on U.S. surface waters or adjoining shorelines and imposes liability for any spill that contaminates these surface waters on the owner and operator of the vessel or on-shore facility that was the source of the spill. The Act also requires that the owners and operators of vessels and facilities from which oil or hazardous substances could be spilled in harmful quantities prepare plans—known as Spill Prevention, Control and Countermeasure (SPCC) Plans—for preventing these types of spills and outlining measures that are to be taken if a spill does occur.

Oil and natural gas exploration and production operations are subject to regulation under the Clean Water Act in various ways. Among other things, any discharges of wastewaters such as produced waters from well sites to navigable waters or their tributaries are fully subject to the NPDES permit requirements under the CWA. In addition, stormwater runoff from a well site that contains pollutants is subject to the same permitting requirements that are imposed on stormwater discharges from various industrial facilities under the CWA. Moreover, oil and natural gas exploration and production facilities are fully subject to the spill requirements of the CWA, including the need to prepare SPCC plans to minimize any potential for spills that could harm nearby waters.

THE EXEMPTION FROM STORMWATER PERMITTING REQUIREMENTS FOR OIL AND NATURAL GAS EXPLORATION IS QUITE LIMITED

In adopting the CWA, Congress has at various times considered how the provisions of the Act should apply to oil and natural gas exploration and production activities in light of the unique circumstances of well sites so as not to unnecessarily impede vital energy production. For example, in fashioning the scope of the stormwater permit program included in the CWA in 1987, Congress specifically considered how these new permitting requirements should specifically apply to stormwater runoff from oil and natural gas exploration and production facilities.[2] Following its review Congress determined that it was appropriate to provide a limited exemption from stormwater permitting requirements for oil and natural gas exploration and production sites because of their unique nature. This exemption applies only in those specific situations where the stormwater runoff is not contaminated by and does not come into contact with raw materials, intermediate or finished products, byproducts or waste products in the first place. Thus, if the stormwater runoff from an oil or natural gas well site is contaminated with materials such as oil, grease or hazardous substances, the operator of the well site is not exempt from the regulations under the CWA and must still obtain permit coverage from EPA or from the appropriate state permitting authority under the NPDES program.

In enacting this limited permitting exemption, Congress recognized that oil and natural gas operators were already taking the proper steps to control stormwater runoff from well sites and other facilities. Congress also recognized that if such runoff was uncontaminated there was little more to be gained by requiring operators to incur the costs and potential delays of obtaining a new burdensome permit. Therefore, the congressional committee responsible for fashioning the stormwater permit program concluded that:

> to avoid penalizing operators for using good management practices designed to prevent or minimize pollution and for making expenditures to prevent stormwater run-off contamination, uncontaminated stormwater diversion devices should not be regulated under the permit scheme of the Act.[3]

[2] 33 U.S.C. § 1342(l)(2).
[3] H.R. Rep. No. 99-189, at 37 (1985).

Consequently, "[w]ith this limitation on the permitting requirements for such stormwater runoff, important oil [and] gas . . . operations will be able to continue without unnecessary paperwork restrictions . . . ."[4]

At the same time, decided in 1987 to extend these stormwater permitting requirements in general to construction projects. EPA initially determined that these stormwater permitting requirements should apply to construction projects that disturb more than five acres. Moreover, EPA also determined that oil and natural gas well sites being prepared for drilling should be treated as construction sites and not as oil and natural gas sites subject to the limited exemption from stormwater permitting requirements. Even after EPA eventually lowered the threshold for the applicability of the stormwater permitting requirements to construction activities from five acres to one acre in response to litigation, the Agency believed that relatively few oil and natural gas sites that were being developed would fall under the NPDES stormwater permitting requirements. However, it eventually became clear that this fundamental assumption was entirely wrong—in fact, members of the oil and natural gas industry subsequently made EPA aware that close to 30,000 oil and natural gas sites annually could be subject to stormwater permitting under EPA's interpretation. Given this key information, EPA decided to reassess whether thousands of oil and natural gas sites that were just being prepared for drilling should indeed be subject to the burdens of the NPDES stormwater permitting program.

This issue was eventually resolved by Congress in the Energy Policy Act of 2005 ("EPAct"). In light of the significant implications of any permitting requirements for energy production, Congress clarified in the EPAct that the limited exemption from stormwater permitting requirements for oil and natural gas exploration and production operations originally included in the 1987 amendments to the CWA should indeed extend to construction-related activities at oil and natural gas sites, including activities that are necessary to prepare a site for drilling for oil or natural gas.

In taking this action, Congress rejected the notion that there should be different standards applied for oil and natural gas construction sites and simply subjected the process of preparing oil and natural gas sites for drilling to the same standards for stormwater permitting that already apply once drilling and production commence. In doing so, Congress continued to provide an exemption from permitting requirements that is limited in scope, i.e., again if stormwater runoff from sites being prepared for drilling is contaminated with pollutants such as oil or hazardous substances, the permitting exemption does not apply and the operator is still required to obtain permit coverage for such discharges. It is only when the stormwater runoff from oil and natural gas sites—including runoff associated with construction activities at these sites—is uncontaminated that operators are exempt from permitting requirements. Under these circumstances, a requirement that an operator obtain permit coverage would serve little purpose other than imposing unnecessary and unjustified regulatory burdens—and the associated costs—on oil and natural gas exploration and production and would only serve to unreasonably impede the development of American energy supplies.

Even with this limited exemption, there are still many layers of other effective controls currently in place which act to ensure that stormwater flows off of oil and natural gas sites do not adversely affect human health and the environment. One layer of control is the standard management practices already adopted by the oil and natural gas industry itself to control stormwater runoff. In fact, EPA has readily acknowledged that the oil and natural gas industry has already implemented effective practices to prevent soil erosion and runoff associated with the preparation of sites for drilling and other construction activities. The Agency has stated that these industry practices "result in practical, cost-effective approaches that are flexible enough to address the variety of situations and water quality concerns that might be encountered in the field."[5]

At the same time, states still retain their inherent governmental powers to exercise regulatory controls should they become concerned about the impact of sediment or other discharges from oil and natural gas site operations. In fact, many states with active oil and natural gas exploration and production activity already have requirements in place independent of their NPDES programs to effectively address sediment and erosion control at oil and natural gas sites. For example, the State of West Virginia requires the use of BMPs at sites being prepared for drilling activity consistent with the erosion and sediment control field manual issued by the Office of Oil and Gas of the West Virginia Department of Environmental Protection. These requirements have proven to be very effective and efficient in ensuring that any concerns about sediment deposition are properly addressed. These state pro-

[4] 133 Cong. Rec. H171 (daily ed. Jan. 8, 1987) (statement of Rep. Hammerschmidt).
[5] 71 Fed. Reg. at 33633.

grams are consistent with the national policy set forth in the CWA of preserving the primary responsibilities and rights of the states to prevent, reduce and eliminate pollution and to plan the development and use of land and serve to supplement the federal permitting programs already in place.

SPCC REGULATION

EPA has likewise considered how to apply various other provisions of the CWA to oil and natural gas exploration and production activities. For example, in promulgating regulations for the SPCC program, EPA has only taken very limited actions to accommodate the unique circumstances of well sites. As noted above, oil and natural gas production facilities are subject to the oil spill provisions of the CWA and operators of well sites must therefore prepare SPCC plans for their well sites if they meet the same criteria that apply to all facilities, i.e., more than a specified amount of oil can be stored on the site and if spilled the oil could enter a surface water in harmful quantities. The SPCC plan must specify operating procedures that the facility uses to prevent oil spills as well as control measures to prevent any oil spill from reaching nearby waters and measures to contain and clean up any spill that does reach nearby waters or their shorelines. Like the owners and operators of other types of facilities that are subject to these oil spill requirements, operators of well sites must report spills of oil to the proper authorities and are responsible for cleaning up and restoring the affected area in the event of a spill.

However, when EPA amended its SPCC regulations in 2002, it imposed requirements on oil and natural gas exploration and production facilities that were subsequently found to be unduly restrictive and burdensome. Accordingly, as part of its revisions to the SPCC regulations in 2008, EPA modified certain requirements applicable to well sites to provide the operators of these sites with greater flexibility in meeting the regulatory requirements while continuing to balance the need to ensure that that the potential for any spills of oil or hazardous substances from well sites that may reach navigable waters is appropriately minimized against the unnecessary burdens imposed by new regulations on the production of American oil and natural gas resources. These amendments remain subject to public comment and may be further revised before they are finalized.

CONCLUSION

As can be seen, oil and natural gas exploration and production activities are subject to key regulatory requirements imposed by the CWA. However, both Congress and EPA have taken reasonable steps to minimize unnecessary burdens on oil and natural gas production without compromising substantive environmental protection. The congressional action in the EPAct extending the limited NPDES stormwater permitting exemption to cover drilling and construction-related activities was not an attempt to provide special treatment for oil and natural gas sites; rather, it was an effort to clear up the unnecessary confusion and make sure that these activities were subject to the same standards that already apply to oil and natural gas operations themselves. This congressional action did not expand any permitting exemptions for these operations and the NPDES permitting exemption continues to remain limited in scope and apply only where stormwater runoff is not contaminated, just as was the case before the passage of the EPAct. Likewise, well sites remain subject to the oil spill provisions of the SPCC and recent EPA amendments to the SPCC regulations simply represent an effort to minimize the impacts of these regulations on oil and natural gas production without limiting critical environmental protections for the nation's waters.

ENCLOSURE—NATIONAL ENVIRONMENTAL POLICY ACT

The National Environmental Policy Act (NEPA)[1] was enacted on January 1, 1970 in order to establish a national environmental policy to be implemented by all federal agencies across the government. Viewed as a landmark piece of legislation, NEPA was enacted in order to: (1) formally declare a national policy which will encourage productive and enjoyable harmony between man and his environment; (2) to promote efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of man; and (3) to enrich the understanding of the ecological systems and natural resources important to the nation.

NEPA imposes a number of key requirements on federal governmental agencies in order to achieve these goals. For example, as a general matter, the federal government is required to use all practicable means to preserve and maintain condi-

[1] 42 U.S.C. §§ 4321–4347.

tions under which human beings can coexist with the natural world in productive harmony. In addition, federal agencies are specifically required to lend appropriate support to initiatives and programs meant to prevent the degradation of the environment, as well as to directly incorporate environmental considerations in their decision making, using a systematic, interdisciplinary approach.

Perhaps the most significant element of NEPA is the requirement that federal agencies prepare an environmental impact statement (EIS) for those actions which are classified as "major federal actions that will significantly affect the quality of the human environment." An EIS is an in-depth analysis, often several hundred pages in length, of the potential environmental impacts associated with a federal action. The EIS also examines alternatives to the proposed action and the environmental impacts of those alternatives. This requirement concerning the preparation of an EIS addresses the federal decision-making process by creating methods for stakeholders to present information and concerns regarding the environmental aspects of various federal actions. However, NEPA's EIS requirements are procedural in nature; specific environmental standards are addressed under federal or state regulatory laws such as the Clean Water Act or the Clean Air Act.

As directed under NEPA, the federal Council on Environmental Quality (CEQ) has promulgated the necessary regulations to implement the requirement to prepare these EISs in those cases where major Federal actions are proposed. Under these regulations CEQ has specified that the federal actions that are potentially subject to these EIS requirements are defined broadly to include such actions as federal construction projects, the issuance of federal permits and leases, and federal funding of state, local or private actions, among various other types of federal projects. However, while federal actions are generally subject to NEPA, not every federal action requires an EIS; rather, only federal actions significantly affecting the quality of the human environment must have an EIS.

In fact, in many cases various federal actions may be exempted from the EIS requirement through one of two mechanisms. First, the CEQ regulations authorize federal agencies to specifically identify various categories of actions that by their nature do not have a significant impact on the environment in the first place; these categories of activities are generally referred to as "categorical exclusions." Most federal agencies have developed their own "categorical exclusions" that cover a wide variety of routine federal actions, including such actions as maintenance activities on federal properties, oversight of state environmental programs, and inspections and enforcement activities. Any federal actions which fall under a categorical exclusion do not require any specific environmental analysis and are not subject to EIS requirements.

Second, for those actions that are not covered by a categorical exclusion, CEQ regulations authorize agencies to prepare a limited analysis, commonly known as an Environmental Assessment (EA), which generally amounts to a very preliminary review of the possible impacts of a proposed federal action on human health and the environment. The purpose of an EA is to determine whether a federal action will have a significant impact on the environment, which would trigger the need for an EIS. If the conclusion of the EA is that an action would not significantly affect the human environment, the federal agency may then issue a Finding of No Significant Impact (FONSI), which concludes the agency's NEPA obligations for that action and in these cases the federal agency is not required to continue to prepare an EIS in order to satisfy NEPA.

CONGRESS HAS NOT PROVIDED AN UNWARRANTED NEPA EXEMPTION FOR OIL AND NATURAL GAS PROJECTS

In an effort to facilitate the prudent development of our nation's energy supplies and to move toward energy independence, Congress sought to reach a careful balance in the Energy Policy Act of 2005 (EPAct) between encouraging oil and natural gas development and assuring the protection of human health and the environment. As part of this approach, Congress established under Section 390 of EPAct a rebuttable presumption that activities related to oil and natural gas development on federal land or pursuant to leases of federal interests in oil and natural gas reservoirs should be subject to a categorical exclusion under NEPA; in these cases the cognizant federal agency would not be required to prepare an EIS or an EA. Under EPAct, this rebuttable presumption applies where:

- the surface disturbance associated with the activity is less than five acres so long as the total disturbance on a lease area is less than 150 acres and a site-specific analysis under NEPA (i.e., an EA or an EIS) has previously been prepared;

- an oil or natural gas well is being drilled at a location where drilling has previously occurred within the last five years;
- an oil or natural gas well is being drilled within a developed field where the drilling activity has been analyzed within the last five years in an approved land use plan or an EA or EIS prepared under NEPA;
- a pipeline is being placed in an approved corridor; or
- the activity consists of maintenance.

As can be seen, this EPAct requirement cannot be viewed as a substantial "carve-out" from NEPA—rather it provides a well-reasoned, limited categorical exclusion that avoids unnecessary, duplicative, and costly EIS requirements for those oil and natural gas projects that would be deemed to have minimal impacts in the first place or have already been adequately studied in other prior NEPA reviews. For certain oil and natural gas projects EPAct Section 390 creates a rebuttable presumption that a NEPA review is not required in connection with an Application for Permit to Drill at a specific well site where an EA or EIS has already previously examined the potential impacts of drilling in the area in which the proposed drilling site is located. In other cases this section would simply clarify that no site-specific environmental review is necessarily required in two situations where environmental impacts would be minimal in any event, i.e., where the drilling will be conducted on a site that is already disturbed or where the only activity being undertaken is maintenance.

In essence, this provision attempts to strike a balance and is indeed quite narrow in scope—it does not at all represent a complete exclusion from NEPA requirements for these types of oil and natural gas activities. Instead, in enacting Section 390 Congress has established only a limited categorical exclusion from the EIS requirements for a set of oil and natural gas activities that have already been subject to environmental review or are the types of activities that normally have minimal environmental impacts. In fact, in any given case the federal agency overseeing the activity could nevertheless still decide to prepare an analysis of the potential environmental impacts of drilling at a well site in the form of an EA or EIS because of particular concerns about that impacts at that location.

In any event, because it only applies to the activities or actions of federal agencies or activities on federal lands, NEPA would still by its own terms have no application to many oil and natural gas drilling operations in the first place even in the absence of the congressional action taken in EPAct. For example, NEPA would not apply to most drilling activities in the Marcellus Shale in the Northeast, the Barnett Shale in Texas, or the Fayetteville Shale in Arkansas, where the federal government owns relatively little land and few rights to subsurface oil and natural gas. Likewise, it would have no applicability to drilling in the coalbeds of the Black Warrior Basin in Alabama since drilling activity there is undertaken solely on private lands.

FEDERAL AGENCIES WILL CONTINUE TO PROTECT THE ENVIRONMENT

While Congress has acted to reasonably streamline the NEPA approval process for oil and natural gas drilling activities, this action does not at all suggest that the federal government is actually attempting under EPAct to abdicate its responsibilities to ensure that these activities are undertaken in a manner protective of human health and the environment—rather, just the contrary is true. In fact, the two principal federal land management agencies—the U.S. Bureau of Land Management (BLM) and the U.S. Forest Service (USFS—part of the U.S. Department of Agriculture (USDA))—with responsibilities over federal lands where oil and natural gas operations are undertaken have at the same time also adopted specific policies under NEPA and other applicable federal land management statutes to ensure that ongoing operations are conducted in a manner fully protective of human health and the environment and in accordance with federal environmental policies. For example, BLM has formally stated as part of its agency policy that it will:

- conduct on-site inspections of all proposed drilling locations even where a categorical exclusion under NEPA applies;
- review an Application for Permit to Drill in the same fashion as would have been done in the absence of a categorical exclusion;
- continue to consult, where appropriate, with the U.S. Fish and Wildlife Service, state historic preservation offices and other officials regarding the potential impacts of drilling activities; and
- apply mitigation measures identified in previously prepared EAs or EISs in order to minimize the environmental impacts of drilling.

Similar to BLM, USDA (which includes the USFS) also has emphasized in its operational agency policies that the Department will continue to ensure that oil and

natural gas drilling activities use best management practices in order to minimize the effects of these activities on surface resources and prevent unnecessary or unreasonable surface resource disturbances, stating that:

> It is critical to note that use of Section 390 in no way limits or diminishes the Forest Service's substantive authority or responsibility regarding review and approval of a [Surface Use Plan of Operations] . . . . The Authorized Forest Officer will continue to assure that operations on leaseholds on National Forest System lands will minimize effects on surface resources and prevent unnecessary or unreasonable surface resource disturbance, including effects to cultural and historical resources and fisheries, wildlife and plant habitat. Best management practices are to be applied as necessary to reduce impacts of any actions approved under these categorical exclusions.

CONCLUSION

In sum, the EPAct was not intended to be integrated as a new government policy to excuse oil and natural gas projects from key environmental reviews; rather, Congress enacted Section 390 of the EPAct merely to eliminate unnecessary, redundant and costly environmental reviews for certain types of oil and natural gas drilling projects in an effort to streamline the approval process for the construction and operation of energy projects that will move our nation toward energy independence. In fact, while Congress authorized the adoption of a process to exempt certain oil and natural gas projects from further NEPA scrutiny in certain cases, this exemption was quite narrowly drawn and therefore only applies to a limited number of energy projects. It was based on a close review of the estimated impacts of these proposed projects in light of actual experience and represents a careful balance with respect to encouraging necessary energy development while protecting human health and the environment. In any event, even in those cases where these categorical exclusions from NEPA may apply, the relevant federal land management agencies have emphasized that they still continue to take steps to ensure that the use of the categorical exclusions will not result in any lessening of substantive environmental protections—that is, the permits will continue to have specific provisions to manage the environmental risks of oil and natural gas development. As a result Section 390 of EPAct does not sacrifice environmental protections but simply expedites the production of vital American supplies of oil and natural gas that is needed for our country.

ENCLOSURE—RESOURCE CONSERVATION AND RECOVERY ACT

Enacted in 1976, the Resource Conservation and Recovery Act (RCRA)[1] was passed to achieve three key goals: namely, to (1) conserve energy and natural resources, (2) reduce or eliminate the generation of hazardous waste as expeditiously as possible, and (3) protect human health and the environment. Congress subsequently amended RCRA in 1980 to address a number of key new issues raised in implementing this law, and then again in 1984 when it adopted the Hazardous and Solid Waste Amendments (HSWA) Act; HSWA established further waste cleanup and corrective action requirements, restrictions that prohibit the disposal of certain wastes in or on the land unless the wastes comply with specified treatment standards and/or waste constituent levels, and various other technical requirements for the management and disposal of solid and hazardous wastes.

One of the key portions of RCRA—Subtitle C—is intended to effectively control the management and disposal of hazardous waste from "cradle to grave." The waste management framework established by Subtitle C is designed principally to address "low volume," "high toxicity" wastes generated at one site and transported to another for disposal. Consistent with this framework, RCRA bans the disposal of "hazardous wastes"—which are broadly defined under the statute—at facilities without valid permits. In order to obtain a permit, any new treatment, storage or disposal facility must meet stringent specifications for handling RCRA Subtitle C or hazardous wastes. Permitted facilities are subject to a wide range of management standards mandating ground-water protection, facility closure, and post-closure care requirements. Other specific management standards apply to targeted waste management units such as containers, tanks, surface impoundments, waste piles, land treatment units, landfills and incinerators.

RCRA also establishes a comprehensive system designed to closely track the generation, storage, transport and disposal of Subtitle C wastes. Any company which generates these wastes above certain threshold amounts must register with EPA

[1] 42 U.S.C. §§ 6901–6992K.

and/or an authorized state agency and comply with their requirements. These generators also must satisfy applicable recordkeeping and waste marking, labeling and placarding requirements in preparing wastes prior to shipment for off-site disposal. The Act provides that EPA may delegate to the states the authority to administer and enforce these various regulatory requirements and in the case of most states, the Agency has done so.

Taken together, the Subtitle C requirements impose costly and rigorous limitations—constraints that were made more demanding by the 1984 HSWA Act. However, RCRA's broad definition of hazardous waste had the effect of expanding RCRA's scope well beyond the "low volume," "high toxicity" wastes it was originally designed to cover.

CONGRESS DID NOT INTEND TO REGULATE OIL AND NATURAL GAS EXPLORATION AND PRODUCTION WASTES UNDER RCRA

As a result of regulations proposed by EPA in 1978 to implement the 1976 Act, Congress recognized that certain types of wastes presented unique issues and were most likely not well suited to regulation under EPA's highly prescriptive Subtitle C regulatory scheme. These concerns particularly applied to those wastes that were produced in substantial volumes but also had relatively low toxicity. In fact, these wastes posed management issues that were far different than the issues posed by Subtitle C wastes generated by manufacturing and other industrial operations under routine circumstances.

One particular category of these "high-volume, "low-toxicity" wastes consisted of drilling fluids, produced waters and other wastes associated with the exploration and production of oil and natural gas. In the course of early deliberations concerning potential amendments to RCRA, Congress specifically considered regulations for these categories of wastes that had previously been proposed by EPA. However, after careful deliberation Congress found that the extensive regulatory program proposed by EPA to regulate drilling fluids, produced waters and related wastes, i.e., wastes generated from oil and natural gas exploration and production operations, could have a significant economic impact on American oil and natural gas production.[2] Moreover, Congress also recognized that the large volumes of these wastes really could not be handled by existing waste management units. Based on these concerns, Congress concluded that these wastes should be subject to a different regulatory scheme than other more "mainstream" Subtitle C wastes.

EPA HAS CONCLUDED THAT REGULATION OF OIL AND NATURAL GAS EXPLORATION AND PRODUCTION WASTES UNDER THE SUBTITLE C WASTE MANAGEMENT PROGRAM IS NOT APPROPRIATE

Congress specifically considered the proper way to handle these "high-volume," "low-toxicity" wastes in addressing changes to RCRA in 1980. After considering a wealth of information, Congress decided that instead of specifically including these wastes under the general Subtitle C waste management program, EPA should instead set up a specialized way to address the need for any regulatory controls for these wastes. As part of this specified process, Congress first required EPA to study how these wastes were being managed by the states at that time and whether such existing management practices were adequate in light of the nature of these wastes. As part of this process, EPA was specifically required to look at the sources and volume of drilling fluids, produced water and other "high-volume," "low-toxicity" wastes associated with oil and natural gas exploration and production; potential risks to human health and the environment from surface runoff or leaching from these wastes; existing disposal practices, alternatives to such practices and the costs of these alternatives; and the impact of any alternatives on oil and natural gas exploration and production.

Once this study was completed, EPA was required to submit it to Congress for its review. EPA was further required under this specialized process to make a determination within six months from the time the report was given to Congress regarding whether the imposition of any additional regulatory controls on "high-volume," "low-toxicity" wastes was warranted. In the event that the Agency subsequently determined that drilling fluids, produced waters and related categories of wastes should be regulated under the standard RCRA Subtitle C waste management controls, Congress directed that any regulations implementing such a decision would not become effective unless specifically approved by Congress. In amending RCRA in 1980 Congress applied a similar process to other similar types of "high-volume," "low-toxicity" waste such as fly ash waste and slag wastes, noting that such amend-

[2] S. Rep. No. 96-172 at 6 (1980), reprinted in 1980 U.S.C.C.A.N. 5019, 5024-25.

ments were necessary to "bring the implementation of the Act closer to the original intent of Congress."[3]

As a result of this mandated study, EPA subsequently determined that "high-volume," "low-toxicity" wastes associated with oil and natural gas production should not be regulated under the RCRA Subtitle C waste management program. In reaching this conclusion, the Agency first confirmed that the wastes produced in connection with oil and natural gas exploration and production were being produced in substantial quantities. For example, EPA found that 361 million barrels of drilling waste were generated in 1985 as the result of drilling activities at about 70,000 well sites and that over 800,000 active well sites generated 20.9 billion barrels of produced water. Perhaps even more important, EPA also found in this study that a wide range of practices for the management of such waste had already been effectively adopted under various state regulatory programs as a result of widely varying geological, ecological, topographic, economic, geographic and other differences among well sites.

Based on these findings EPA's study came to the conclusion that imposing any form of RCRA Subtitle C waste management controls on these types of oil and natural gas exploration and production wastes was not effective and would not only result in substantial economic hardships for the oil and natural gas industry, but would also place severe and undue administrative burdens on regulated oil and natural gas companies and regulatory authorities themselves. For example, EPA's 1988 study found that:

- imposing strict Subtitle C waste management controls on the handling and management of "high-volume," "low-toxicity" wastes could impose costs on the oil and natural gas industry exceeding $6.7 billion;
- imposing these controls could also lead to declines in oil and natural gas production of up to 12 percent and costs to consumers of approximately $4.5 billion;
- the current RCRA program did not provide adequate flexibility for addressing this specialized class of wastes;
- regulating oil and natural gas exploration and production wastes under the strict Subtitle C waste management controls could lead to severe permitting delays that would disrupt production of vital American energy supplies and could severely strain the existing capacity of facilities authorized to treat and dispose of hazardous wastes;
- existing state and federal regulatory programs were generally adequate to manage oil and natural gas wastes and any gaps in these regulatory programs could be effectively addressed by regulation under RCRA programs for non-hazardous waste (Subtitle D) and by working with the states on their regulatory programs;
- the state regulatory programs were specifically tailored to the unique circumstances of the oil and natural gas industry and it would be impractical and inefficient to impose the relatively inflexible RCRA Subtitle C waste regulations on oil and natural gas exploration and production wastes because of the potential for disrupting these state regulatory programs; and
- substantial burdens would be imposed on EPA and state regulatory authorities if even a small percentage of the hundreds of thousands of oil and natural gas exploration and production facilities were required to obtain permits to treat, store or dispose of waste under the RCRA Subtitle C waste management program. [4]

In light of this independent review, EPA's decision not to regulate these "high-volume," "low-toxicity" wastes from oil and natural gas exploration and development was a careful decision based on sound science and technical support. In the years since it made its original determination, EPA has still not found it necessary to revisit its determination or change its conclusions regarding the inappropriateness of regulating these oil and natural gas wastes under the RCRA Subtitle C waste management system.

At the same time, consistent with its prior determination EPA has continued to work with state regulatory officials to ensure that state regulatory programs remain adequate to address any issues with respect to the control and disposition of these wastes. For example, in 1988 the Agency initiated a program in cooperation with state regulators to review state programs for the regulation of oil and natural gas exploration and production waste on a periodic basis. This process has now been formalized through the State Review of Oil & Natural Gas Environmental Regulations (STRONGER), which involves representatives of state and federal regulatory agencies, industry and environmental advocacy organizations. As part of this review

[3] S. Rep. No. 96-172 at 2, reprinted in 1980 U.S.C.C.A.N. at 5020.
[4] 53 Fed. Reg. 25446 (July 6, 1988).

process, state regulatory programs are compared to a set of national guidelines which is regularly updated in order to identify areas for improvement in existing state programs. More than 30 reviews of state programs responsible for the regulation of over 85 percent of American onshore oil and natural gas production have been conducted under this process.

CONCLUSION

In enacting RCRA and overseeing its implementation, Congress recognized that certain types of "high-volume," "low-toxicity" waste such as the drilling fluids, produced waters and other wastes produced in connection with the exploration and production of oil and natural gas are different in key respects from the types of wastes typically managed under the RCRA Subtitle C regulatory program and that it may not be appropriate to subject such wastes to the strict requirements of that program. After careful study EPA has again subsequently confirmed that it would be impractical, costly and disruptive to manage these oil and natural gas wastes under the RCRA Subtitle C waste regulations. The decision not to regulate oil and natural gas exploration and production wastes as Subtitle C wastes under RCRA reflects the nature of those wastes and the reality that the RCRA Subtitle C regulatory program is not designed to and was never intended to address these wastes in the first place.

ENCLOSURE—SAFE DRINKING WATER ACT

Congress enacted the federal Safe Drinking Water Act (SDWA)[1] in 1974 to ensure that water supply systems serving the public meet appropriate standards to protect the public health. As part of SDWA, the U.S. Environmental Protection Agency (EPA) is required to establish (1) national drinking water regulations to address contaminants that might adversely affect human health, and (2) an Underground Injection Control (UIC) program to protect underground sources of drinking water from contamination. To address these requirements, EPA has implemented a program for the treatment and disinfection of water supplies that must be met by public water supply systems across the country and also has established standards for maximum levels of various contaminants that may be found in drinking water provided to the public (these are known as maximum contaminant levels or MCLs). SDWA also specifies that EPA may delegate to the states the authority to enforce drinking water regulations and to issue UIC permits if the state has a program in place that meets certain minimum requirements established by Congress, and in fact these federal programs are now largely administered by the states.

Similar to other landmark federal laws passed at that time, SDWA was specifically intended to cover the disposal of wastes that might threaten underground sources of drinking water (USDWs) and not production-related operations themselves. Congress initially passed SDWA based on its recognition that various industrial and agricultural practices had resulted in increased concentrations of potentially harmful chemicals that were entering the nation's drinking water sources.[2] For example, in the key congressional report from the U.S. House of Representatives Committee on Interstate and Foreign Commerce accompanying the 1974 law, this congressional committee recognized the concerns of the U.S. Geological Survey and the Bureau of Mines regarding the "indiscriminate 'sweeping of our wastes underground'" and noted that these wastes were coming from many sources, such as municipalities that "increasingly engag[e] in underground injection of sewage, sludge and other wastes. Industries are injecting chemicals, byproducts and wastes. . . . Even government agencies, including the military, are getting rid of difficult to manage waste problems by underground disposal methods."[3] Consistent with this view, the intended focus of the UIC program when it was originally enacted as part of SDWA in 1974 was on managing the discharge of wastes into geologic formations. In order to ensure that this issue was effectively addressed, SDWA was specifically designed to establish a federal-state partnership to "protect drinking water from contamination by the underground injection of waste."[4]

CONGRESS DID NOT INTEND TO REGULATE HYDRAULIC FRACTURING UNDER THE UIC PROGRAM

At the same time, Congress did not intend that the UIC program would be extended to regulate wells that are themselves used for the production of oil or nat-

[1] H.R. Rep. No. 93-1185 (1974), reprinted in 1974 U.S.C.C.A.N. 6454, 6481.
[2] H. R. Rep. No. 93-1185 (1974), reprinted in 1974 U.S.C.C.A.N. 6454, 6459.
[3] H.R. Rep. No. 93-1185 (1974), reprinted in 1974 U.S.C.C.A.N. 6454, 6481.
[4] Natural Resources Defense Council v. U.S. Environmental Protection Agency, 824 F.2d 1258, 1268 (1st Cir. 1987).

ural gas. In considering SDWA, Congress recognized that many states already had vigorous regulatory programs in place to govern petroleum operations and that these programs had been more than adequate through the years to ensure that these operations would not harm underground sources of drinking water, particularly in many of the energy-producing states in the South and Western portions of the country. To ensure that SDWA was properly targeted, Congress intended to limit the scope of SDWA to avoid imposing unnecessary regulations that would be a constraint on energy production, divert funds from energy development and represent an inflationary factor in energy costs. In accordance with this approach,

Congress focused the UIC program on waste disposal activities that threatened the quality of underground drinking water sources and never sought to regulate wells that were themselves being used for oil and natural gas production.

Given the focus of the UIC program on the underground disposal of waste, EPA also had never thought to regulate energy production operations such as hydraulic fracturing—a critical oil and natural gas production technique that will be essential to the aggressive development of the nation's energy resources—under SDWA. In fact, EPA's regulations for the UIC program address a variety of wells, including wells used for the disposal of hazardous waste (Class I wells), wells used for the disposal of wastes from oil and natural gas production activities and wells used to enhance oil and natural gas production from existing production wells (Class II wells), and other types of disposal wells such as cesspools (Class III-V wells). However, those regulations do not purport to regulate hydraulic fracturing.

Hydraulic fracturing is a well stimulation technology that has been used for 60 years in millions of energy production operations. As Congress has already recognized, hydraulic fracturing has been effectively regulated for decades by the states and is essential for the future development of America's oil and natural gas supplies. State regulations require the use of various techniques to protect drinking water aquifers, including the use of steel casing and cement to seal off shallow formations containing drinking water sources from materials being pumped into and out of an oil or natural gas well. These regulations effectively protect against any risks to drinking water aquifers; consequently, there would be no additional environmental benefits to further federal regulation of hydraulic fracturing under SDWA.

In fact, hydraulic fracturing differs in many key respects from what have traditionally been viewed as waste disposal activities intended for regulation under EPA's UIC program. As part of these waste disposal operations, wastes are specifically injected into subsurface formations for purposes of disposal and are intended to be left in the subsurface. In contrast, hydraulic fracturing is an activity that takes place in the production well itself and is a part of the process of completing the well and preparing it for the production of oil and natural gas. The fluids used in the hydraulic fracturing process—consisting mostly of water—are pumped into an oil- or natural gas-bearing formation that is generally thousands of feet below any aquifers being used for drinking water.[5] Moreover, the fluids that are pumped into the subsurface as part of the hydraulic fracturing process are intended to be removed from the formations into which they are pumped. Indeed, studies of coalbed methane wells in Alabama have shown that 80 percent or more of the fluids pumped into a well during the hydraulic fracturing process are eventually recovered from the well during the production process.[6]

In light of these fundamental differences between hydraulic fracturing and subsurface waste injection, many of the regulations developed by EPA to implement the UIC program simply have no application to hydraulic fracturing activities whatsoever. For example, EPA's regulations require that certain parameters such as injection pressure, flow rate and cumulative volume of fluids injected be monitored weekly or monthly and in some cases on a daily basis.[7] These requirements for ongoing monitoring would simply not apply or be practical for an activity such as hydraulic fracturing that takes only a few hours to complete.

SDWA was never meant to create special treatment for these kinds of energy-producing operations—instead, SDWA recognized that there was a need to regulate

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[5] While such formations may contain groundwater that would technically meet the definition of an "underground source of drinking water" under SDWA because the water contains less than 10,000 milligrams per liter of total dissolved solids, such groundwater would not in practice be used as drinking water-and would certainly not be tapped by a private drinking water well - because it is of low quality, would require significant treatment in order to be potable and would be quite expensive to access.

[6] Palmer, I.D., et al., Comparison between gel-fracture and water-fracture stimulations in the Black Warrior basin; Proceedings 1991 Coalbed Methane Symposium, Univ. of Alabama (Tuscaloosa), pp. 233-242

[7] 40 C.F.R. § 146.23(b)(2).

waste disposal operations and not to impose undue regulatory burdens on production operations if they were not necessary. When Congress amended SDWA in 1980, it relied on the fact that the states already had existing programs in place to regulate oil and natural gas exploration and production activities, including activities that could be considered as "underground injection" subject to regulation under SDWA. In order to take advantage of the experience of state regulators and to avoid disrupting existing state programs, Congress specifically provided in Section 1425 of the Act that states could assume primary authority over Class II injection wells—those associated with oil and natural gas production activities—by demonstrating that their programs meet the same basic standards as those established by Congress for programs administered by EPA.

While many parties have sought to reexamine this law, even EPA itself has specifically emphasized that SDWA was never intended to regulate wells that are themselves used for the production of oil or natural gas. For example, in addressing the scope of SDWA in Legal Environmental Assistance Foundation v. U.S. Environmental Protection Agency,[8] the Agency expressly argued that Congress never intended to regulate hydraulic fracturing as "underground injection" under SDWA. While the U.S. Court of Appeals subsequently decided that hydraulic fracturing fit the definition of "underground injection" and so had to be regulated under the Act, the court's decision ignored the intent of Congress and did not consider whether hydraulic fracturing actually posed any risk to drinking water supplies in the first place. In fact since this ruling the court's decision has been severely criticized for its failure to follow the will of Congress and ignoring EPA's long-standing interpretation of the specific scope of SDWA.

Because of the regulatory uncertainty created by this court decision, Congress amended SDWA in the Energy Policy Act of 2005 to specifically clarify that hydraulic fracturing is not regulated as a form of underground injection under SDWA except that EPA does have the authority to regulate the use of diesel in the fluids employed in the fracturing operations. This exemption simply confirmed the well-recognized proposition that the UIC provisions of SDWA were primarily intended to regulate the subsurface disposal of waste and that Congress never intended to regulate an activity such as hydraulic fracturing under SDWA. Moreover, Congress's decision to clarify SDWA to exempt hydraulic fracturing from unnecessary regulation is consistent with the longstanding congressional mandate under this law to avoid impeding oil and natural gas production unless restrictions are absolutely necessary to protect underground sources of drinking water.

FEDERAL REGULATION OF HYDRAULIC FRACTURING IS NOT NECESSARY

Contrary to unsupported claims, Congress's position that hydraulic fracturing should be excluded from additional federal controls under SDWA is based on sound science. For example, in 2004 EPA completed a study of the potential impacts of hydraulic fracturing of coalbed methane (CBM) wells on drinking water supplies; the Agency has, in fact, characterized this study as the most extensive review of the potential impacts of hydraulic fracturing on public health ever undertaken.[9] As part of this study, EPA reviewed information about alleged incidents of drinking water well contamination believed by the affected parties to be associated with hydraulic fracturing or other CBM development activities. A draft of the study report was subject to extensive public comment and was thoroughly reviewed by numerous EPA offices, other federal agencies and a peer review panel of experts.

After much scrutiny and careful review, the Agency found in this key 2004 study that, although thousands of CBM wells are fractured annually, there were "no confirmed cases [of contamination of drinking water wells] that are linked to fracturing fluid injection into CBM wells or subsequent underground movement of fracturing fluids." EPA also identified a number of key factors that minimize the risk posed by hydraulic fracturing to underground sources of drinking water (USDWs), even though that term is very broadly defined in SDWA and may include aquifers that are not in fact used as sources of drinking water and would be quite unlikely to serve as sources of drinking water. These factors include the removal of much of the fracturing fluid from the subsurface once fracturing operations are completed and the dilution, dispersion and adsorption as well as the potential biodegradation of any fluids that remain in the subsurface. Consequently, EPA concluded that hydraulic fracturing of CBM wells poses little or no threat to USDWs. This EPA study

[8] 118 F.3d 1467 (11th Cir. 1997).

[9] See Evaluation of Impacts to Underground Sources of Drinking Water by Hydraulic Fracturing of Coalbed Methane Reservoirs, EPA Office of Water (June 2004).

confirmed the results of prior studies by state regulators which essentially reached the same conclusion.[10]

In addition, Congress recognized that there was little need for federal regulation of hydraulic fracturing because the states had been quite satisfactorily regulating the practice for many years. For example, the Ground Water Protection Council (GWPC), a highly-regarded national organization representing state officials charged with protection of groundwater, had studied the impacts of hydraulic fracturing and came to the conclusion that there are no technical threats posed by these oil and natural gas operations to human health and the environment. In reaching this conclusion, GWPC noted that:

As the front line regulators of the state oil and natural gas UIC program, we have not seen credible evidence that the hydraulic fracturing of coal bed methane reservoirs, or any other deeper formations, causes any documented threat to underground sources of drinking water. The states have maintained oversight of hydraulic fracturing as a part of the oil and natural gas production process. This makes good regulatory sense and has stood the test of time for over 50 years. Any requirement to regulate this process as underground injection would not result in any additional environmental protection of under ground sources of drinking water (USDW) and, it would strain already depleted state UIC resources. The result would be that money that could be used to solve severe contaminant source problems, such as urban storm water or large capacity cesspools, would be diverted to a practice that is already regulated under another program and is not a threat to USDWs.[11]

CONCLUSION

In short, trying to regulate hydraulic fracturing under the UIC program would be like trying to fit a square peg into a round hole. Given the lack of harm to drinking water aquifers and the need to focus limited regulatory resources on actual threats to drinking water, Congress's decision in 2005 to clarify the scope of regulation under SDWA to exclude hydraulic fracturing was entirely reasonable and reflected the active support of state regulators in charge of groundwater protection.

ENCLOSURE—SUPERFUND

In 1980 Congress responded to the problems posed by contaminated waste sites such as those at Love Canal (near Niagara Falls, New York) and Times Beach, Missouri by passing the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA).[1] Commonly referred to as the federal "Superfund" law, CERCLA was intended to encourage the prompt and expeditious cleanup of numerous abandoned hazardous waste disposal sites and other contaminated properties scattered across the country. In enacting CERCLA, Congress had recognized that there was a "gap" in addressing the need to remediate hazardous waste sites—the federal Resource Conservation and Recovery Act (RCRA) was already in place to govern the handling and disposal of hazardous wastes from active facilities, but there was still a need to address the environmental problems posed by the plethora of old, non-operating hazardous waste sites in the country.

To help achieve the statute's goals, CERCLA established a very onerous liability scheme under which parties could be held strictly, jointly, severally and retroactively liable for the cleanup of hazardous waste landfills and other contaminated sites. Under CERCLA four categories of parties can be held liable for the cleanup of these sites, including current and former owners and operators of the sites as well as entities that generated hazardous substances which were disposed of at a contaminated site and any entity that transported these hazardous substances to these sites. In addition, CERCLA provides broad powers to federal and state governments to recover the costs that these governments incurred in remediating these sites to required cleanup levels.

As part of the funding mechanisms for the law, CERCLA further established a very substantial trust fund referred to as the Hazardous Substance Superfund (the "Trust Fund") that was intended to be used to help fund these cleanup activities. This fund, financed by an excise tax on crude oil, petroleum products and other specified chemicals, was specifically intended to help support the U.S. Environmental Protection Agency (EPA) in carrying out the Agency's responsibilities under

[10] See Ground Water Protection Council, Survey Results On Inventory and Extent of Hydraulic Fracturing In Coalbed Methane Wells In the Producing States (Dec. 15, 1998); Interstate Oil and Gas Compact Comm'n, States Experience With Hydraulic Fracturing (July 2002

[11] Letter from Thomas P. Richmond, GWPC President, to The Hon. James Inhofe and The Hon. James Jeffords (June 8, 2005).

[1] 42 U.S.C. §§ 9601-9675.

the law, essentially amounted to a feedstock tax that was imposed on the oil and natural gas industry in a manner to reflect the industry's responsibilities for these hazardous waste problems. Additional monies were provided to this Trust Fund in the amendments to CERCLA adopted as part of the Superfund Amendments and Reauthorization Act of 1986 (SARA) to further support cleanup activities.

In enacting CERCLA, Congress attempted to strike a careful balance among a number of critical factors shaping the overall cleanup program. First, there already were a number of federal laws on the books that were intertwined with the scope of CERCLA. For example, the federal Clean Water Act (CWA) had previously been adopted to regulate the cleanup of oil spills and related remediation activities; RCRA also had been passed in order to address cleanup issues at active industrial sites. At the same time, there were also a number of other pending federal legislative proposals that would have addressed other facets of cleanup responsibilities such as the cleanup of oil pollution in the nation's navigable waters. Against this background, two key elements of CERCLA were included in order to strike a reasonable accommodation with these other environmental activities: (1) the "petroleum exclusion" and (2) the treatment of "federally-permitted releases."

THE "PETROLEUM EXCLUSION"

The "petroleum exclusion" reflected the numerous reasonable steps taken by Congress to fashion a responsible cleanup program in the face of many competing pressures. First, Congress recognized that the principal focus of the cleanup program should be on releases of hazardous chemicals, which was the most serious threat to human health and the environment posed by the abandoned waste sites. Indeed, in commenting on the need for the Superfund program at that time, then-EPA Administrator Douglas Costle noted that "[t]he problem of hazardous spills is acute and more threatening than oil."[2] As a result CERCLA was passed to provide EPA with the necessary tools to address the widespread and serious contamination at old chemical waste sites like the Love Canal site in New York or the "Valley of the Drums" site in Kentucky—these sites included large landfills covering many acres and a wide variety of manufacturing and waste processing facilities that had handled large volumes of chemicals for many years and that had very high levels of hazardous chemical contaminants in the soils and extensive plumes of contaminated groundwater that threatened drinking water supplies.

Second, although the cleanup of chemical waste sites was given a high priority by Congress in enacting CERCLA, Congress had never intended to ignore the need to clean up petroleum contamination, but instead decided to address these issues much more effectively through other programs. For example, recognizing the need to address oil spills, Congress had already passed key provisions in the CWA as noted above to address spills of petroleum into the surface waters, thus negating the need to address it again during the deliberations on CERCLA. Congress subsequently expanded the regulation of oil spills by passing the Oil Pollution Act of 1990 (OPA), which imposes liability on any party responsible for a vessel or onshore facility from which oil is discharged to the waters of the United States (which includes most surface waters and adjacent wetlands) or adjoining shorelines for the cost of cleaning up those discharges and for the damages that may result from the incident. OPA was adopted to directly respond to the concerns raised in the congressional debates on Superfund regarding the need to hold parties responsible for a wide range of surface spills of petroleum. For underground storage tanks (USTs) containing petroleum, Congress also eventually added provisions to RCRA in 1984 to address any leaking USTs. This program specifically imposes requirements to prevent leaks from USTs containing petroleum as well as to ensure the proper monitoring of these tanks and corrective actions if these tanks leak.

In any event, the adoption of the so-called "petroleum exclusion" is consistent with the general principles that the courts themselves have adopted in interpreting the scope of CERCLA responsibilities. In addressing the question of CERCLA liability, an overwhelming number of courts have consistently ruled that companies which sell useful products such as petroleum and/or crude-oil products themselves should not be subject to CERCLA in the first place. According to this universally-standard rule, CERCLA was intended to cover only the disposal of contaminated products, not the use of uncontaminated petroleum and crude oil supplies.

Consistent with this view, EPA also has interpreted the "petroleum exclusion" rule only to cover hauling and transport of crude oil and refined petroleum products themselves, including those substances that are normally found in crude oil or are normally added to crude oil as part of the standard refining process. However, to

[2] 126 Cong. Rec. H 9248 (Sept. 18, 1980) (statement of Rep. Harsha).

the extent that petroleum or petroleum products eventually become contaminated with hazardous substances as a result of use or otherwise, then these supplies would no longer be covered under the "petroleum exclusion" rule and they would then become subject to CERCLA liability just like any other contaminated waste materials. As a result, companies which have generated waste motor oils or hydraulic oils, or other types of used petroleum products, would be required to clean up sites that have become contaminated from the disposal of these waste products just as with any other hazardous wastes.

FEDERALLY-PERMITTED RELEASES

CERCLA also contains a provision excluding "federally-permitted releases" from CERCLA liability. This exclusion covers releases of hazardous substances to the environment that have been authorized pursuant to a variety of federal permits, such as a National Pollutant Discharge Elimination System (NPDES) permit or a dredge or fill permit issued under the CWA, or an air permit issued under various provisions of the Clean Air Act. In addition, Congress included within the exclusion for federally-permitted releases any injection of fluids or other materials authorized under state law (i) for the purpose of stimulating or treating wells for the production of crude oil, natural gas or water, (ii) for the purpose of secondary, tertiary or other enhanced recovery of crude oil or natural gas, or (iii) which are brought to the surface in conjunction with the production of crude oil or natural gas and are subsequently reinjected into the subsurface.

These "federally-permitted releases" exemptions have been quite misinterpreted in many cases. This CERCLA exemption was not included as a means to avoid imposing any liability on responsible parties, but rather to ensure that permitting issues were instead properly addressed under the respective federal regulatory programs in which they were administered in the first place. Indeed, in enacting this particular exclusion, Congress specifically recognized that "in view of the large sums of money spent to comply with specific regulatory programs," any liability for releases of hazardous substances in accordance with duly issued permits "should be determined based on the facts of each individual case."[3] Accordingly, Congress provided that liability for these types of releases should not arise under CERCLA, but should more properly be determined under the law pursuant to which the release was authorized or under common law so as to "give regulated entities clarity in their legal duties and responsibilities."[4] A similar provision is included in the Oil Pollution Act of 1990.

CONCLUSION

CERCLA was enacted in order to address the environmental problems posed by abandoned, inactive contaminated waste sites and hazardous substance spills. This law casts a broad web of liability on responsible parties for the cleanup of these sites and resulted in a dramatic shift in the nature of liability for these problems—imposing a new federal standard involving strict, joint and several liability that could be imposed retroactively and without regard to fault for conduct occurring years earlier.

In adopting this approach, Congress had to grapple with the impacts of imposing this far-reaching new liability regime on other pre-existing federal environmental regulatory requirements and to try to ensure that these other federal laws were still properly implemented. To achieve this goal, Congress chose to codify two particularly key provisions: the "petroleum exclusion" and the exclusion for federally-permitted releases. Neither of these exemptions was adopted in order to afford special treatment to the oil and natural gas industry or any specific industry. Rather, they were included either for sound practical reasons or because it was clear that the scope of CERCLA should have never covered these situations in the first place. There has been no intent to ignore any environmental problems caused by the spillage of crude oil or petroleum. In fact, as Congress intended, any environmental problems caused by contaminated petroleum or crude oil supplies are amply addressed under CERCLA or under a plethora of other federal environmental regulatory authorities.

[3] S. Rep. No. 96-848 at 46 (1980).
[4] 126 Cong. Rec. S 14965 (Nov. 24, 1980) (Statement of Sen. Randolph).

STATEMENT OF THE WILDERNESS SOCIETY

The oil and gas industry and their allies continue to insist that the only way to address our country's energy challenges is to open more public lands and waters to oil and natural gas drilling, and reduce environmental and safety standards. In truth, oil and gas drilling in America is already occurring at an astonishing pace and in a bewildering number of places. Yet, in the Rocky Mountain West vast expanses of public lands open to drilling and under lease by the industry are not being used, and thousands of drilling permits issued to companies by the Bureau of Land Management (BLM) are sitting idle.

More oil and gas drilling occurs in America every year than anywhere else in the world.

As of January 13, there were 1,764 rotary drilling rigs operating on U.S. lands and waters.[1]

America ranks #2 in world natural gas production, and #3 in oil production.

The U.S. is the second largest natural gas producer in the world[2] and the third-largest producer of oil.[3]

Tens of thousands of wells are drilled every year in the U.S.

At the beginning of the last decade 27,000 oil and gas wells were drilled in the U.S. in one year. But in 2010 over 40,000 new wells were drilled on American lands and waters.[4]

The West's public lands are already extensively drilled, leased, and available for leasing. There are tens of thousands of oil and natural gas wells on public lands, with thousands more currently approved for drilling and tens of thousands more planned for the future.[5] Tens of millions of acres of federal public lands are available for leasing under current BLM Resource Management Plans.

Tens of millions of acres of onshore and offshore federal lands are already under lease to oil and gas companies—the vast majority of it unused.

According to BLM data, as of the end of FY 2012, 37,792,212 acres of federal public lands are leased for oil and gas development, an area larger than the State of Florida.[6] However, only one third of these leases— 12,512,974 acres— are in production. In addition, over 34 million acres of offshore federal lands are under lease in the Gulf of Mexico alone, where roughly 4,000 platforms produce oil and/or gas.[7]

The United States has become a net exporter of refined petroleum products.

In 2011, the United States exported more petroleum products, such as gasoline and diesel fuel, than it imported for the first time in decades. The trend has continued into 2012 as the U.S. was exporting about 1,000 Mbbl/d in May 2012, according to the United States Energy Information Agency.[8]

The oil and gas industry is sitting on nearly 7,000 approved but idle federal drilling permits.

Though the industry and their political allies persistently complain about "restrictive" government policies that allegedly are thwarting U.S. oil and gas development, the BLM reported in February, 2013, that 6,990 approved onshore federal drilling permits were sitting idle, unused by oil and gas operators who have obtained them[9].

The industry has "shut in" thousands of gas wells on western public lands during the past four years, but continues to complain about their alleged "lack of access" to federal lands for drilling.

For example, according to the Wyoming Oil & Gas Conservation Commission, as of 2009, there were over 12,500 shut-in coal bed methane wells in the Powder River

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[1] http://investor.shareholder.com/bhi/rig__counts/rc__index.cfm

[2] Data as of 2010 (most recent available). United States Energy Information Agency http://www.eia.gov/cfapps/ipdbproject/IEDIndex3.cfm?tid=3&pid=26&aid=1#

[3] United States Energy Information Agency. http://www.eia.gov/cfapps/ipdbproject/IEDIndex3.cfm?tid=5&pid=53&aid=1

[4] United States Energy Information Agency. http://www.eia.doe.gov/emeu/mer/pdf/pages/sec5__4.pdf

[5] As of December 1, 2008, there were 88,357 oil and gas wells on BLM lands. Government Accountability Office. http://www.gao.gov/new.items/d10245.pdf

[6] Bureau of Land Management, http://www.blm.gov/wo/st/en/prog/energy/oil__and__gas/statistics.html

[7] BOEMRE, Gulf of Mexico Region Blocks and Active Leases by planning Area, January 3, 2011; EIA, Overview of U.S. Legislation and Regulations Affecting Offshore Oil and Natural Gas Activity, p. 2, September, 2005.

[8] United States Energy Information Agency, http://www.eia.gov/dnav/pet/pet__move__wkly__dc____NUS-Z00__mbblpd____.htm

[9] Correspondence from Celia Boddington, BLM, to David Alberswerth, TWS, February12, 2012.

Basin of Wyoming alone![10] Thousands more natural gas wells have been shut-in elsewhere in Wyoming and the West, primarily due to low natural gas prices.

Low natural gas prices—not government policies or regulations—are causing many companies to reduce spending on natural gas projects on federal lands, a strategy intended to drive up prices.

For example, the CEO of Ultra Petroleum, a large independent producer with major investments in gas wells on federal lands in Wyoming, recently told his investors of the company's strategy to curtail exploration activities because, "We don't believe in cash flow growth or production growth without economic returns."[11] Moreover, "Industry-wide, you're just beginning to see natural gas production roll over. Once it begins, it will accelerate, and I think we are looking at a two-year window of monthly reductions in domestic natural gas supply. So it's taken us and the industry some time to react to the market signals, but we have and we won't be quick to over-invest in the coming years. We've seen natural gas prices respond positively, but they are a long, long way away from levels that will attract capital." In other words, natural gas producers will increasingly be curtailing their drilling activities, in a strategy designed to raise consumer prices.

THE WILDERNESS SOCIETY,
Washington, DC, February 19, 2013.

Hon. RON WYDEN,
Chairman, Committee on Energy and Natural Resources, U.S. Senate, Washington, DC.

Hon. LISA MURKOWSKI,
Ranking Member, Committee on Energy and Natural Resources, U.S. Senate, Washington, DC.

DEAR CHAIRMAN WYDEN AND RANKING MEMBER MURKOWSKI:

We respectfully request that this letter and the accompanying information be included in the Committee on Energy and Natural Resources February 12, 2013, hearing record regarding "Opportunities and Challenges for Natural Gas". Accompanying this letter are two fact sheets: "Oil and Gas Drilling on Federal Lands—Some Key Facts"; and "Most BLM Lands in the Five Rocky Mountain States are Open to Oil & Gas Leasing." These fact sheets document a number of often overlooked but relevant facts regarding the availability of federal onshore lands for oil and gas development.

At least one witness during the February 12 hearing implied that federal land management polices are somehow inhibiting the oil and gas industry's ability to gain access to federal onshore lands for oil and gas development. The relevant facts, however, portray a completely different reality with regard to this question: tens of millions of acres of onshore federal lands are currently available for oil and gas development; tens of millions of acres of federal lands are under lease to oil and gas companies; nearly 7,000 federal drilling permits have been issued to companies but are not being utilized by them; and over ninety-two thousand oil and gas wells are operating on federal onshore lands, with thousands of new wells permitted by the Bureau of Land Management every year.

In conclusion and as the accompanying documents demonstrate, the oil and gas industry has available to it tens of millions of acres of onshore federal lands. The real issue that Congress should contemplate is not whether federal policies are unnecessarily inhibiting the extraction of oil and gas resources from our federal lands, but instead whether there are sufficient safeguards in place to assure that (1) the most environmentally sensitive public lands are protected from the adverse impacts of oil and gas development, and (2) that oil and gas extraction and development activities on federal lands are done in an environmentally safe manner.

Sincerely,

DAVID ALBERSWERTH,
Senior Policy Advisor.

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[10] http://www.uwyo.edu/eori/__files/co2conference10/tom%20doll%20eori__30june2010__2009-2010.pdf

[11] http://phx.corporate-ir.net/phoenix.zhtml?c=62256&p=irol-irhome

Most BLM Lands in the Five Rocky Mountain States are Open to Oil & Gas Leasing

The chart below shows that more than *90%* of BLM lands in the five Rocky Mountain States are open to leasing under current Resource Management Plans (RMP). It attempts to account for RMP amendments that revised the amount of land available for leasing. Those amendments are noted parenthetically. Also, unavailable data is highlighted in blue.

COLORADO[1]			
RMP	**BLM Mineral Acres**	**BLM Mineral Acres Available to Leasing**	**Percent Available to Leasing**
Glenwood Springs RMP (as amended by Glenwood Springs Oil and Gas RMPA and Roan Plateau RMPA)	795,671	767,911	97%
Grand Junction RMP	1,459,391	1,341,601	92%
Gunnison RMP	726,918		
Kremmling RMP (as amended by CO Oil and Gas Leasing RMPA)	651,000	640,880	98%
Little Snake RMP	2,400,000	2,157,440	90%
Northeast RMP (as amended by CO Oil and Gas Leasing RMPA)	600,000	474,000	79%
Royal Gorge RMP	2,300,000	2,223,684	97%
San Luis RMP	623,000	605,886	97%
San Juan/San Miguel RMP (as amended by CO Oil and Gas Leasing RMPA)	1,291,000	1,187,848	92%
Uncompahgre RMP	755,923	734,885	97%
White River RMP	1,820,900	1,737,180	95%
TOTAL	12,696,885	11,871,315	93%

MONTANA[2]			
RMP	**BLM Mineral Acres**	**BLM Mineral Acres Available to Leasing**	**Percent Available to Leasing**
Big Dry RMP	7,600,000	7,516,600	99%
Butte RMP	660,819	632,045	96%
Dillon RMP	1,355,202	1,209,278	89%
Garnet Resource Area RMP	213,385	205,066	96%
Headwaters Resource Area RMP	655,505	634,607	97%
Judith Valley Phillips RMP (as amended by Bitter Creek and Mountain Plover ACEC RMPA)	3,387,687	3,210,125	95%

[1] http://www.blm.gov/co/st/en/BLM_Programs/land_use_planning/rmp.html
[2] http://www.blm.gov/mt/st/en/prog/planning.html

Miles City District Oil and Gas RMPA (Billings and Powder River RMPs)	3,185,016	3,131,645	98%
TOTAL	17,057,614	16,539,366	97%
NEW MEXICO[3]			
RMP	**BLM Mineral Acres**	**BLM Mineral Acres Available to Leasing**	**Percent Available to Leasing**
Albuquerque (Rio Puerco) RMP	1,412,708	1,353,238	96%
Carlsbad RMPA	4,095,000	3,984,300	97%
Farmington RMP	3,020,693	2,828,545	94%
Mimbres RMP	4,126,780	3,859,830	94%
Roswell RMP	9,740,000	9,341,911	96%
Socorro RMP	6,095,423	4,552,749	75%
Taos RMP	1,517,850	992,110	65%
White Sands RMP (as amended by McGregor Range and Otero County ACEC RMPAs)	2,731,804	1,982,337	73%
TOTAL	32,470,258	28,895,020	90%
UTAH[4]			
RMP	**BLM Mineral Acres**	**BLM Mineral Acres Available to Leasing**	**Percent Available to Leasing**
Box Elder RMP	1,013,952	1,013,952	100%
Cedar Beaver Garfield Antimony RMP	1,071,400	1,071,400	100%
House Range RMP			
Kanab RMP	554,000	475,000	86%
Moab RMP	1,821,997	1,451,747	80%
Monticello RMP	1,784,319	1,290,919	72%
Pony Express RMP	2,073,595	2,073,595	100%
Price RMP	2,723,000	2,154,000	79%
Richfield RMP	2,128,000	1,680,700	79 5
St. George RMP	671,545	644,717	96%
Vernal RMP	1,917,634	1,727,200	90%
Warm Springs RMP	2,226,755	2,226,755	100%
TOTAL	17,986,197	15,809,985	88%
WYOMING[5]			
RMP	**BLM Mineral Acres**	**BLM Mineral Acres Available to Leasing**	**Percent Available to Leasing**
Buffalo RMP	4,731,100	4,612,823	98%
Casper RMP	4,657,172	4,430,604	95%
Cody RMP	1,508,200	1,483,630	98%

[3] http://www.blm.gov/nm/st/en/prog/planning.html#albuquerque
[4] http://www.blm.gov/ut/st/en/prog/planning/existing_plans.html
[5] http://www.blm.gov/wy/st/en/programs/Planning/rmps.html

Grass Creek RMP	1,171,000	1,171,100	100%
Green River RMP (as amended by Jack Morrow Hills CAP)	3,848,800	3,516,540	91%
Kemmerer RMP	1,578,980	1,397,205	88%
Lander RMP	2,809,102	2,783,966	99%
Newcastle RMP	1,698,866	1,698,866	100%
Pinedale RMP	1,199,280	745,580	62%
Rawlins RMP	4,552,340	4,479,110	98%
Snake River RMP	15,123	0	0%
Washakie RMP	1,602,900	1,591,700	99%
TOTAL	29,372,900	27,911,700	95%
ROCKIES (CO, MT, NM, UT, WY)			
TOTAL	109,583,854	101,027,386	92%

THEODORE ROOSEVELT CONSERVATION PARTNERSHIP,
Washington, DC, February 18, 2013.

Hon. RON WYDEN,
Chairman, Senate Energy and Natural Resources Committee.

Hon. LISA MURKOWSKI,
Ranking Member, Senate Energy and Natural Resources Committee.

DEAR CHAIRMAN WYDEN, RANKING MEMBER MURKOWSKI AND MEMBERS OF THE COMMITTEE:

Thank you for the opportunity to provide testimony and comment on the hearing entitled, "Opportunities and Challenges for Natural Gas." The Theodore Roosevelt Conservation Partnership (TRCP) agrees that a balance must be achieved among the range of natural resource values to ensure the proper development of natural gas on federal public lands. There must be an even balance between the development of natural gas resources and the conservation of our natural resources to ensure sustainability of the biological and economic values of these natural resources.

TRCP supports responsible energy development and has worked over the past decade to promote principles and recommendations that will help our country achieve the balance needed to continue producing energy while conserving the environment. TRCP and our conservation partners, a coalition of 22 conservation and sportsmen organizations that make up the Fish, Wildlife, and Energy Working Group, have developed the, "FACTS for Fish and Wildlife" a set of recommendations that, when implemented, resolve conflict that has been evident in the past. FACTS, an acronym which stands for Funding, Accountability, Coordination, Transparency, and Science, represent the key actions needed to resolve on-going conflicts between energy and renewable natural resources.

While the focus of the hearing was on how to manage the increase in natural gas extraction and potential exports, it must be recognized that there are significant impacts to the landscape during energy exploration and production. New technology has allowed previously un-developable gas resources to be tapped—many in sensitive fish and wildlife habitats. This is evident in the serious decline of mule deer habitats and populations in portions of Wyoming and Colorado, and also has broad implications for development in sage grouse habitats in 11 western states. On federal public lands the priority for energy development has overridden the multiple-use mandate in some sensitive locations.

To successfully achieve balance between energy extraction and natural resource conservation, we recommend implementation of the FACTS principles and taking the following actions:

- Identify habitats that are too valuable or special to have natural gas development at this time and require that any development be done off-site. This includes areas of world class recreational opportunities and irreplaceable habitats or landscapes;
- Provide clear direction on what constitutes "multiple-use" and what is considered "undue and unnecessary degradation" of the environment under Federal Land Planning and Management Act (FLPMA).
- Broadly and consistently implement the 2010 Department of the Interior oil and gas leasing reforms.

- Evaluate the economic and employment loss in local communities due to the impacts of industrialized energy development on outdoor recreation economies and communities.
- Provide new guidance on mitigation at the landscape level and what constitutes adequate compensation where impacts cannot be mitigated effectively.

We must be aware that many landscapes and communities, particularly those with abundant public lands and where natural gas extraction is proposed, rely on the significant jobs and economic benefits associated with outdoor recreation on public lands. In many cases the identity and culture of locales have been built around these opportunities. For example, a recent study by Southwick Associates for Sportsmen for Responsible Energy Development showed that counties with a higher percentage of public lands managed for conservation and recreation reported higher levels of job and population growth than those with higher percentages of lands managed for commodity production. In Cody, Wyoming, hunters, anglers and wildlife watchers contributed over $30 million to Cody's economy in 2010-2011. Let's not forgo a sustainable source of jobs and income based on a recreation economy for one that is not sustainable—the key is to find the proper balance in both.

We are pleased that you chose to hold this hearing so early in the 113th Congress and look forward to finding the "sweet spot" where energy development and natural resource conservation can coexist. The sportsmen-conservation community has extensive experience in this area and we believe TRCP and its partners can help Congress navigate this new opportunity and chart the course for a strong domestic energy supply that is balanced with the needs of fish, wildlife, and sportsmen.

We look forward to working with Congress and the Obama Administration on this endeavor.

Sincerely,

WHIT FOSBURGH,
President and CEO.

FACTS FOR FISH AND WILDLIFE

ENERGY DEVELOPMENT RECOMMENDATIONS FROM THE THEODORE ROOSEVELT CONSERVATION PARTNERSHIP

Energy and our ability to access affordable, reliable fuel and electricity are fundamental to the American way of life. All forms of energy, oil, natural gas, coal, wind, solar, geo-thermal and nuclear energy must be transported via pipelines or transmission lines. These two realities pose challenges for energy development and natural resource management. Energy production and transmission have been controversial for a long time in America, and in 2013 we still have no comprehensive policy that drives energy production and transmission. As a result, both have followed a scattershot approach, often based around variables such as markets, investment, permitting and access instead of a national strategy. One consequence of this approach is a great underestimation of how energy production and transmission affects fish, wildlife and outdoor recreation, often to the detriment or exclusion of these values and resources. Sixty-seven percent of U.S. lands are privately owned. In the West, the division of private and public lands is about 50/50 with some states like Nevada (81%) and Utah (63%) being mostly publicly owned. Because wildlife does not understand or respect artificial boundaries like state or property lines, it is imperative that lands be managed across boundaries.

Traditionally, conservation and sportsmen organizations with a stake in energy issues have focused on public lands, and rightfully so, as those lands are held in trust for all Americans and are mandated to provide multiple-use, sustained yield for many values, including fish and wildlife. But as our need for expanded energy resources (particularly renewable energy) and transmission capacity increases, the impetus for managing fish and wildlife throughout all lands—regardless of ownership—is increasing as well. Good stewardship and conservation benefit both public and private lands, and management recommendations for fish and wildlife on public lands can easily be adopted on private lands.

As part of our Passport for Responsible Development, the TRCP has created the "FACTS for Fish and Wildlife," specific recommendations for balancing fish and wildlife needs with the development of energy resources. First released in 2006, this revision updates those recommendations, expands their applicability to broader geographic regions and private lands, and addresses forms of energy development beyond traditional oil and gas. The "Passport for Responsible Energy Development" will allow for better fish and wildlife stewardship through better policy and management during energy development.

The FACTS recommendations are applicable, with a few exceptions, to land and water, traditional or renewable energy, public or private lands, and infrastructure associated with development. They can increase our ability to responsibly manage fish and wildlife during energy development, balance competing values, become conservation stewards and ensure a future for our fish and wildlife populations. These practices-driven by the FACTS—will sustain and uphold our nation's shared natural resources and unique outdoor legacy.

The TRCP supports and promotes responsible energy development that balances land and resource values that sustain fish and wildlife populations and maintain opportunities for hunting and fishing. Our work is guided by the TRCP Fish, Wildlife and Energy Working Group (FWEWG), a team comprised of representatives of our conservation partner organizations, and a staff of experienced wildlife and policy experts. By combining the science-based expertise of the FWEWG with an active network of sportsmen, the TRCP Center for Responsible Energy Development is working with hunters and anglers throughout the country to conserve our outdoor traditions by supporting a balanced approach to energy development and the management of fish and wildlife resources.

Too often, sportsmen's voices are not heard when energy policies are being decided or when development is implemented. The Theodore Roosevelt Conservation Partnership believes that if the principles contained in this "Passport for Responsible Development" are followed, the management of fish and wildlife habitats will be improved and American sportsman will be given a voice, thereby resulting in the conservation of millions of acres of wild spaces that fish and wildlife need and that hunters and anglers cherish.

Join Hunters and Anglers for Responsible Development, a free grassroots movement that will add your voice to those of other sportsmen and -women nationwide. Speak up to ensure your values are integrated into energy development on your public lands. For more information about how join the TRCP go to our website, www.trcp.org, or call 202-639-TRCP.

(F) Funding

Successful fish and wildlife management requires adequate funding. Traditionally, fish and wildlife programs are underfunded or rely on funding sources other than federal monies. While funding alone will not solve the problem, it plays a critical role in our ability to balance energy development with the needs of fish and wildlife. Funding must be secure, substantial and properly allocated to make a difference.

F.1 Determine adequate funding for sustainable fish/wildlife management, including monitoring, in areas proposed for energy development.

F.2 Prior to development, identify and secure appropriate funds for fish/wildlife monitoring and mitigation, including compensation if necessary or required.

F.3 Establish a long-term, dedicated "mitigation trust" to benefit fish/wildlife that is funded by royalties, rents, fines or voluntary payments.

F.4 Ensure that funds designated and intended for fish/wildlife management are not redirected to other causes.

F.5 Work cooperatively with various funding sources to leverage additional federal or state grants.

(A) ACCOUNTABILITY

Doing what you said or promised defines accountability. It also entails accepting responsibility for actions that you may or may not have taken. On public lands, promises are made through various decision strategies and should be considered "contracts with the people" that mandate proper stewardship of the nation's lands and minerals. On private lands, accountability increases trust, enabling projects to transcend conflicts that can delay or stop development.

A.1 Proactively address fish/wildlife management and needs with a specific "Conservation Strategy" for each energy field or project. Finalize strategies before development starts, specify recommendations and actions to minimize impacts and establish plans for mitigation, detailed monitoring and adaptive management.

A.2 Establish and update regularly a system of tracking commitments, in plans or agreements, along with any actions contrary to those commitments.

A.3 Ensure that laws, regulations and policies intended to conserve and protect fish/wildlife during energy development are not abdicated or abridged.

A.4 Utilize lease development plans or master lease planning to evaluate and address potential impacts prior to development.

A.5 Notify the public and allow comment on development projects involving public lands or resources. Provide the public with information on modifications to current development plans.

(C) Coordination

Energy development and natural resource management do not occur in a vacuum. Coordination is essential in ensuring that fish and wildlife are properly managed between boundaries. All stakeholders must be involved, and experts that manage fish and wildlife at the local, state or national levels must be included in energy project planning and implementation. Coordination enables us to address unanticipated actions that arise. A key stakeholder in public lands and fish and wildlife resources, the public must be included to build trust and brainstorm tactics.

C.1 Foster broad-based coordination between fish/wildlife managers, landowners and affected stakeholders to ensure fish/wildlife sustainability.

C.2 Establish expanded coordination across geopolitical boundaries between property owners (public and private). Ensure that managers consider the movement corridors of fish/wildlife.

C.3 Coordinate among all affected stakeholders during planning and implementation of public-lands energy projects.

C.4 Include state fish/wildlife agencies in energy development planning and monitoring of fish/wildlife during/after development. C.5 Establish a process for annual review and adjustments of actions that affect fish/wildlife. An adaptive management strategy is appropriate if based on established adaptive management guidelines and science.

(T) Transparency

"There is no disinfectant like sunshine." That statement was used to describe how transparency can avert undesirable activities, particularly in the public interest. Transparency is essential to building trust among stakeholders. Transparency can prevent unnecessary delays, stoppages or bad press. Openness during energy development enables fish and wildlife management that benefits all stakeholders, not just project proponents.

T.1 Identify "Special Places" with exceptional resource concerns or values where energy development should not be allowed. Map these places and incorporate these values into management plans.

T.2 Provide up-to-date information through a range of media and informational outlets to the public and fish/wildlife managers for energy development projects.

T.3 Guide leasing/development by complete and up-to-date baseline information on fish/wildlife resources and by coordinated plans for energy development and fish/wildlife management.

T.4 Provide the public with information about all proposed public lands energy leases and development; allow sufficient time for public comment.

1T.5 Make all meetings related to public-lands use and energy development part of the public record.

(S) Science

Science is the foundation of good land and resource management. It is essential to understanding how fish and wildlife react to energy development and maintaining sustainable populations during and after development. Utilizing known science enables a balanced approach that sustains energy AND fish/wildlife instead of energy OR fish and wildlife.

S.1 Utilize science in all fish/wildlife decisions, particularly when specific research has been conducted on the impacts of energy development. Assure that mitigation and monitoring based on new scientific information is implemented in the energy development process.

S.2 Incorporate science-based mitigation, using tested and proven methods of adaptive management, when making decisions about fish/wildlife management and energy development. Identify and address "gaps" in science prior to development and implement coordinated research to address these gaps.

S.3 If necessary, utilize a third-party review of development and mitigation proposals.

S.4 Establish a credible and qualified "science review team" and engage science-based organizations for fish/wildlife management and development decisions.

S.5 Establish a process to incorporate new information/science into planning/implementation of existing and new energy projects.

A new Strategy for Managing Fish and Wildlife

Managing for impacts before they occur could help conserve some of the species at risk from the current energy boom. The TRCP Fish, Wildlife and Energy Working Group recommends that a "Conservation Strategy" for resources be required before

development begins. This would identify/direct management in coordination to provide a balanced approach. It also would allow stakeholders more involvement, incorporate the latest science and future information, provide for sustainable fish/wildlife, and help produce domestic energy with less conflict.

The basic elements of a Conservation Strategy are:

1. Identification and protection of special places where development should not occur, or be significantly restricted.
2. Establishment of baselines for resources and values for which all future development and mitigation will be compared.
3. Creation of specific plans showing how fish, wildlife, water and sporting recreation will be maintained during all phases of development, including minimum value levels and impact thresholds.
4. Coordination of development with the management of fish, wildlife, water and sporting recreation using adaptive management.
5. Establishment of monitoring protocols before development begins, coordination of monitoring with state fish and game agencies, and commitment of adequate funding for completion of monitoring.
6. Creation of mitigation plans for affected resources and values, implementation plans for mitigation actions based on adaptive management plans, and the creation of a mitigation trust to ensure adequate funding for mitigation activities.
7. Establishment of research protocols to address unknown resource impacts and to provide input to adaptive management programs.
8. Confirm a schedule of annual meetings to plan development scenarios, address impacts and incorporate adaptive management.
9. Commitment to protective stipulations and other restrictions for protecting and sustaining fish, wildlife, water and sporting values.
10. Development of a process to share information/data including publishing science, stakeholder involvement, and integrating new science and information into future plans, actions and management.

Species Spotlight—Sage Grouse

Sage-grouse are synonymous with the expanses of sagebrush prairies in the West and have been a favored game bird for Western hunters for generations. Human alteration of sage habitats for more than 100 years has reduced grouse populations, and there are now less than half the number encountered by early western settlers. Sage-grouse behavior is negatively affected by the increased level of development from drilling and energy production. This fact is confirmed by a growing body of research on the impacts to sage-grouse, which have experienced an approximately 80% decline in the Powder River Basin of Wyoming. Breeding activity is reduced because sage-grouse males are likely to abandon key display grounds within four miles of active drilling. Young birds do not return to sites with heavy development activity, suggesting that populations will not sustain themselves near active well fields. Sage-grouse populations are affected by other factors like drought and human disturbance, but managers cannot ignore or discount the impact we create by developing energy resources. To complicate matters further, wind power is now proposed on many of the remaining core sage-grouse habitats, and it is unknown how sage-grouse will react to this new threat.

In 2010, the U.S. Fish and Wildlife Service determined that the sagegrouse deserved protection under the Endangered Species Act (ESA) but was found to be "precluded from listing" by higher priority species. This move effectively makes the bird a "candidate" species and efforts are now under way from the western states and federal resource agencies to address the deficiencies that will prevent the bird from being listed under the ESA. There is also a push by some advocates to stop hunting sagegrouse in states that still have healthy and viable populations in a misguided attempt to address the declines even though the biggest threats are to habitat and the ability of the BLM to manage energy operations in occupied sage-grouse habitat. Research in the Powder River Basin and the Upper Green River Basin has shown that large blocks of undisturbed sage habitat are necessary to sustain sage-grouse populations. Scientists predict that sage-grouse will disappear from developed areas unless some key habitats are protected. If we lose the ability to hunt sage-grouse or have the species listed under the ESA, the bird will lose one of the biggest advocates they have -American sportsmen.

Species Spotlight: Mule Deer

Mule deer, icons of western big game hunting, are declining in many parts of their range due to changes in land use, drought, predation, disease and periodic severe winters. Accelerated energy development that is reducing irreplaceable, critical win-

ter range could spell disaster for existing populations. The most significant effects are not seen on the land at drilling sites (which can be reclaimed), but are caused by the trucks, personnel, equipment, roads and facilities that displace wintering mule deer. This is evident on the Pinedale Anticline natural gas field called the "Mesa" outside of Pinedale, WY where mule deer populations have declined approximately 60% in the decade since intensive development began. The threats to mule deer range from heavy gas drilling and industrialization of the southwestern portion of Wyoming to the more dispersed, but pervasive, coal bed methane development in the Powder River Basin of Montana and Wyoming. New development from south-central Wyoming to Colorado and Utah affects deer from the Red Desert, Sierra Madre, Piceance Basin and Book Cliffs.

These impacts are most often felt in prime hunting destinations—public lands where multiple-use mandates are supposed to guarantee sportsmen that their wildlife will be sustained. Recent analysis conducted by the TRCP shows a dismal level of coordination between federal land management and state wildlife agencies, making the tough job of managing habitats to meet population objectives much harder. Combined with severe winters (like 2010-2011), other pressures on habitats, the increased risk of poaching and inadvertent road killing, mule deer populations are in significant risk. Energy development could further reduce already declining populations unless federal agencies and industry make changes to current energy development processes. When mule deer lose crucial habitats, sportsmen are at risk of losing access, opportunities and their hunting traditions.

Identification of Special Places

All landscapes and habitats are not created equal, nor do fish and wildlife utilize habitats in the same way. The same can be said of sportsmen. There are places that provide such unique, important, sensitive or extraordinary values that energy development should be restricted or significantly limited. The TRCP calls these areas "Special Places" and recommends that during responsible and balanced energy development these areas be identified and protected. The following criteria are recommended for identification and inclusion into special places, but each part of the country will be different and affected stakeholders (including state wildlife agencies, NGO's, sportsmen, and landowners) should work together to identify areas before the commitment to development begins.

CATEGORIES

1. Areas where no development takes place because of extremely important resources or values, where energy development would irreparably harm those resources, and where no mitigation or compensation could replace their loss or degradation.
2. Areas where development would be restricted to avoid or minimize impacts to important resources and where impacts could be mitigated or compensated for so that no net loss is achievable.

CRITERIA

1. Area of concern provides significant recreational opportunity (hunting/fishing) and is a major component of a local economy. The term "World Class" may be used to describe this resource. The "World Class" designation would indicate that quality of the hunting or fishing experience could not be matched anywhere else in the world.
2. Area of concern is a designated wilderness, a wilderness study area, currently a roadless area, or provides significant wildlife habitat that is not impacted by motor vehicle access.
3. Area provides irreplaceable and substantial habitat for one or more game animals or fish at least during one season of the year and is considered a limiting factor in species population management.

As a nation, we have come to expect energy awareness and conservation from corporations but sometimes forget that individuals also play a big role. Sportsmen and -women are leaders in fish and wildlife conservation and it's no surprise that they are stepping up as leaders in energy conservation as well. Here are five simple steps every sportsman can take to reduce their demand for energy, save money, improve their experiences and ensure they have less impact on our fish, wildlife and water resources as they pursue their passions in the great outdoors.

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