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LIQUEFIED NATURAL GAS

HEARING

BEFORE THE

COMMITTEE ON ENERGY AND NATURAL RESOURCES UNITED STATES SENATE

ONE HUNDRED TWELFTH CONGRESS

FIRST SESSION

TO

CONSIDER MARKET DEVELOPMENTS FOR U.S. NATURAL GAS, INCLUDING THE APPROVAL PROCESS AND POTENTIAL FOR LIQUEFIED NATURAL GAS EXPORTS

NOVEMBER 8, 2011

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CONTENTS

STATEMENTS

APPENDIXES

APPENDIX I

APPENDIX II

LIQUEFIED NATURAL GAS

TUESDAY, NOVEMBER 8, 2011

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

The committee met, pursuant to notice, at 10:32 a.m. in room SD–366, Dirksen Senate Office Building, Hon. Jeff Bingaman, chairman, presiding.

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

The CHAIRMAN. OK, we'll get started. Thank you all for coming today. The subject of this hearing is discussing liquefied natural gas or LNG, and what role it might play in the future of the U.S. natural gas industry.

We had a hearing in 2005 on the future of LNG and the hearing topics from 2005 and today sound similar. However, in 2005 we were thinking about and anticipating the need to import growing quantities of LNG. Today we're thinking about what role LNG exports might play in our energy future.

As I see it there are 2 main objectives of our hearing today.

First, it's important to understand that laws and regulations that govern LNG exports were put into place assuming the United States would be an importing country, not an exporting country. Therefore it probably makes sense to take a new look at them in light of the new market situation.

The second purpose of the hearing, is to understand how exports might affect the domestic natural gas market. The implications of increased gas exports for U.S. job creation and balanced payments could be very positive. At the same time I note that U.S. energy security requires reliable and affordable energy prices, not just reliable supplies. Therefore, understanding how exports might affect domestic prices is also critical.

Currently U.S. natural gas prices are considerably lower than prices in most of the rest of the world. How can we ensure that our export policy is consistent with our continued ability to reap the benefits of our new found abundance of natural gas?

I thank the witnesses for coming to share their perspectives today. Let me defer to Senator Murkowski for any opening statement she has.

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

Senator MURKOWSKI. Thank you, Mr. Chairman. Welcome to the witnesses.

I think it is perhaps, somewhat remarkable, as you note, the changes that we have seen in just a few years. It was maybe 5 or 6 years ago that we were fearing that LNG imports would be necessary at a pretty large scale to meet our domestic demands. I was eager to avoid that for obvious energy security reasons and believe that there would be a greater need for Alaska's natural gas in the lower 48 market. Really the technology seems to be telling us something very different now.

So I want to preface my remarks by noting that for all of the grand planned, all the ideas to establish a national energy policy that had emerged over the years, most of them have missed what would turn out to be the most important development of all. Suddenly we see at our fingertips a massive supply of natural gas which goes a long way toward achieving many of our most fundamental goals whether that's cleaner burning energy or simply more secure, more affordable and certainly more domestic fuel.

As some bit of credit, I think, may be due to our Department of Energy's Fossil R and D program. But I don't think that we should fool ourselves. The government did not make this happen. The natural gas resource is proving up under existing conditions without any mandate, without any tariff or moratorium, without so much as a tweak in any laws or regulations. While Congress has largely talked about fixing a problem, the private sector was taking a huge step toward actually fixing it.

Now Americans are faced with a great problem. This is a great problem to have. What do we do with all of our natural gas?

My own opinion is that we do well not to try and make those decisions from behind this dais up here, but instead let the market work as much as possible. Our proper course won't be sweeping legislation or layers of new regulation. Instead, it will be to ensure a degree of comfort that our new found energy security can be maintained under current export rules.

Now I happen to have some experience on the issue of LNG export in much more challenging conditions than we're discussing today. Many people don't realize that Alaska has had an LNG export terminal for over 4 decades now. We've been shipping gas to Japan from our offshore oil fields in Cook Inlet. In the past several Congresses I've supported renewal of that export license even though the local conditions were somewhat challenging both in terms of price and supply.

That was a complex, difficult decision, especially since we didn't have the luxury of abundant and cheap gas like we do now. But we did have to face reality. The option of exporting LNG served as an incentive for producers in Alaska to keep those supplies coming, especially when local demand was not high enough to merit strong production there in Cook Inlet. Instead what helped keep production flowing was the decision to ensure that companies would sell their excess supply to the always hungry Asian markets.

From experience we should know that we can't expect producers to go out and find natural gas that they cannot, on occasion, expect

to—when they can't expect to sell it to high bidders. That's generally why the industry developed in the first place. That's why the technology has arrived here today.

I've stated publicly and very clearly that there is a Federal interest in our rigorous process for making a determination that exports be in the public interest. Law currently provides that all export licenses be reviewed on a case by case basis. There are no calls to repeal those requirements even though we're in an environment of very low prices and abundant supply. I wouldn't support or encourage such a proposal.

There's caution built into this system, certainly more than there is for other products which we export. I think that that's a good thing.

I'm going to close by suggesting that we would perhaps sleep better at night, I hope, if we knew that our Nation was, again, an energy exporter and with a sufficient supply to comfortably remain an exporter while still doing productive things with plenty of our own supply here at home. Think of the good that we could do.

Instead of dollars flowing out of our country, we would see dollars flowing in.

Instead of jobs being created, investments being made abroad, those benefits would be retained here.

That would do wonders for both our energy security, our trade balance and the growth of our economy.

Mr. Chairman, I appreciate the fact that we are considering these issues today and look forward to the testimony from both panels.

The CHAIRMAN. Thank you very much.

Let me introduce our first witnesses here, our first panel.

Mr. Chris Smith is the Deputy Assistant Secretary for Oil and Natural Gas in the Office of Fossil Energy in the Department of Energy.

Our other witness is Mr. Jeff Wright, who is the Director of the Office of Energy Projects with the Federal Energy Regulatory Commission.

Why don't you proceed in that order unless there's some reason to do it in a different order, but we appreciate if you could give us 5, 6 or 7 minutes of summarizing the main points you think we need to understand. We will include your full statements in the record.

Mr. Smith, go right ahead.

STATEMENT OF CHRISTOPHER SMITH, DEPUTY ASSISTANT SECRETARY FOR OIL AND NATURAL GAS, OFFICE OF FOSSIL ENERGY, DEPARTMENT OF ENERGY

Mr. SMITH. Thank you very much, Chairman Bingaman, Ranking Member Murkowski and members of the committee. I appreciate the opportunity to be here to discuss Department of Energy's regulation of liquefied natural gas exports.

DOE's authority to regulate the export of LNG arises from Section Three of the Natural Gas Act and Section 301B of the DOE Organization Act.

Section 301A of the Natural Gas Act creates a rebuttable presumption that a proposed export of natural gas in the public inter-

est and requires DOE to grant an export application unless the record in the proceeding overcomes this presumption.

The Energy Policy Act of 1992 introduced a new section, 3(c), to the Natural Gas Act. This new section created a different standard of review for applications to export LNG to most countries with which the United States has a free trade agreement. Section 3(c) defines those applications to be consistent with the public interest, to be granted without modification or delay. DOE does not conduct a public interest analysis of these applications and cannot condition them.

On the other hand, DOE conducts a full public interest review of applications to export LNG to non-free trade agreement countries. Utilizing a publicly transparent process DOE conducts a wide range of—considers a wide range of criteria including domestic need for the natural gas proposed for export, U.S. energy security and other relevant issues.

Over the last several years, domestic natural gas production, primarily from domestic shale formations has increased significantly. Natural gas prices and imports of LNG have therefore declined. This has led to an interest by industry in exporting LNG to international markets where higher prices can be obtained.

DOE issued the first order granting long term authority to export lower 48 produced LNG to non-free trade agreement countries in May 2011 to Sabine Pass Liquefaction, LLC. In that order DOE stated that the cumulative impact of the Sabine Pass authorization and similar future authorizations would need to be evaluated to ensure that the total volume of authorized exports by all such authorizations did not threaten the public interest.

DOE presently has before it 4 long term applications to export lower 48, domestically produced LNG to countries with which the United States does not have a free trade agreement. The volumes of LNG that could be authorized for export in these non-free trade agreement applications, including the 2.2 billion cubic feet per day authorized for export in Sabine Pass, total 6.6 billion cubic feet per day which represents about 10 percent of the total current domestic natural gas daily produced in the United States. Consistent with the Natural Gas Act the Department of Energy already has granted authorization from these 5 facilities to export the same volume to free trade agreement countries.

In order to address the potential cumulative impact of a grant of the pending applications, the Department of Energy has commissioned 2 studies, one by EIA and the other by a private contractor. These studies will address the impacts of additional natural gas exports on domestic energy consumption, production and prices, as well as a cumulative impact on U.S. economy including the creation of new jobs, impact on GDP and balance of trade and other factors. We anticipate that these studies will be completed in the first quarter of the calendar year, 2012.

Thank you very much. I would be happy to answer any questions that you may have.

[The prepared statement of Mr. Smith follows:]

PREPARED STATEMENT OF CHRISTOPHER SMITH, DEPUTY ASSISTANT SECRETARY FOR OIL AND NATURAL GAS, OFFICE OF FOSSIL ENERGY, DEPARTMENT OF ENERGY

Thank you Chairman Bingaman, Ranking Member Murkowski, and members of the Committee; I appreciate the opportunity to be here today to discuss the Department of Energy's (DOE) program regulating the export of natural gas, including liquefied natural gas (LNG). DOE's Statutory Authority DOE's authority to regulate the export of natural gas arises under section 3 of the Natural Gas Act, 15 USC 717b, and section 301(b) of the DOE Organization Act, 42 USC 7151. That authority is vested in the Secretary of Energy and has been delegated to the Assistant Secretary for Fossil Energy.

Section 3(a) of the Natural Gas Act sets forth the standard for review of most LNG export applications:

—[N]o person shall export any natural gas from the United States to a foreign country or import any natural gas from a foreign country without first having secured an order of the [Secretary of Energy] authorizing it to do so. The [Secretary] shall issue such order upon application, unless after opportunity for hearing, [he] finds that the proposed exportation or importation will not be consistent with the public interest. The [Secretary] may by [the Secretary's] order grant such application, in whole or part, with such modification and upon such terms and conditions as the [Secretary] may find necessary or appropriate.

Section 3(a) thus creates a rebuttable presumption that a proposed export of natural gas is in the public interest, and requires DOE to grant an export application unless DOE finds that the record in the proceeding of the application overcomes that presumption. Section 3(a) also authorizes DOE to attach terms or conditions to the order that the Secretary finds are necessary or appropriate to protect the public interest.

In the Energy Policy Act of 1992 (EPAct 92), Congress introduced a new section 3(c) to the Natural Gas Act. Section 3(c) created a different standard of review for applications to export natural gas, including LNG, to those countries with which the United States has in effect a free trade agreement requiring the national treatment for trade in natural gas. Section 3(c) requires such applications to be deemed consistent with the public interest, and requires such applications to be granted without modification or delay.

There are currently 15 countries with which the United States has in place free trade agreements that require national treatment for trade in natural gas. These 15 countries include:

—Australia, Bahrain, Canada, Chile, Dominican Republic, El Salvador, Guatemala, Honduras, Jordan, Mexico, Morocco, Nicaragua, Oman, Peru, and Singapore.

There also are two countries—Israel and Costa Rica—that have free trade agreements with the United States that do not require national treatment for trade in natural gas. Additionally, there are three more countries—South Korea, Colombia, and Panama—that have negotiated free trade agreements with the United States. While these three free trade agreements have recently been ratified by the U.S. Senate, the agreements have not yet taken effect. However, as negotiated, the agreements require national treatment for trade in natural gas, which will have the effect of bringing applications to export LNG to those three countries under section 3(c) of the Natural Gas Act.

Because applications under section 3(c) must be granted without modification or delay and are deemed to be in the public interest, DOE does not conduct a public interest analysis of those applications and cannot condition them by the insertion of terms which otherwise might be considered necessary or appropriate.

For applications requesting authority to export LNG to countries that do not have free trade agreements requiring national treatment for trade in natural gas, DOE conducts a full public interest review. A wide range of criteria are considered as part of DOE's public interest review process, including:

—Domestic need for the natural gas proposed for export
—Adequacy of domestic natural gas supply
—U.S. energy security
—Impact on the U.S. economy (GDP), consumers, and industry
—Jobs creation
—U.S. balance of trade
—International considerations
—Environmental considerations

—Consistency with DOE's long-standing policy of promoting competition in the marketplace through free negotiation of trade arrangements
—Other issues raised by commenters and/or interveners deemed relevant to the proceeding

DOE's review of applications to export LNG to non-free trade agreement countries is conducted through a publicly transparent process. Upon receipt of an application, DOE issues a notice of the application in the Federal Register, posts the application and all subsequent pleadings and orders in the proceeding on its website, and invites interested persons to participate in the proceeding by intervening and/or filing comments or protests. Section 3(a) applicants are typically given an opportunity to respond to any such comments or protests and, after consideration of the evidence that has been introduced into the record, DOE issues an order either granting the application as requested, granting with additional terms or conditions, or denying the application.

Under the Natural Gas Act, DOE's orders are subject to a rehearing process that can be initiated by any party to a proceeding seeking to challenge DOE's determinations. Court review is available as well after the rehearing process is exhausted.

RECENT DEVELOPMENTS IN LNG EXPORTS

Over the last several years, domestic natural gas production has increased significantly, primarily due to the development of improved drilling technologies, including the ability to produce natural gas trapped in shale gas geologic formations. The most recent data and analysis prepared by the Energy Information Administration (EIA) within DOE shows an increasing volume of shale gas production. Specifically, EIA indicates that domestic gross gas production from shale increased to 3.4 trillion cubic feet (Tcf) in 2009, compared to 2.3 Tcf in 2008.[1] Further, in the Annual Energy Outlook 2011 (AEO 2011), EIA projected that, by 2015, annual dry shale gas production will increase to 7.2 Tcf and, by 2035, to 12.2 Tcf. Natural gas prices have declined and imports of LNG have significantly declined. Recently, the domestic price of natural gas at the Henry Hub for November 2011 delivery was $3.60 per million Btu.[2] International prices of LNG are significantly higher. Due in part to these changing market economics, DOE has begun to receive a growing number of applications to export domestically produced lower-48 natural gas to overseas markets in the form of LNG.

Insofar as these applications have involved exports to free trade agreement countries, they are by statute, deemed consistent with the public interest and DOE is required to grant them without modification or delay. To the extent the applications involve non-free trade agreement countries, as I have indicated above, DOE conducts a thorough public interest analysis and attaches terms and conditions which are necessary or appropriate to protect the public interest.

SABINE PASS LIQUEFACTION, LLC

DOE received the first application for long-term (greater than 2 years) authority to export LNG produced in the lower-48 States to non-free trade agreement countries on September 7, 2010, from Sabine Pass Liquefaction, LLC (Sabine Pass), a subsidiary of Cheniere Energy, Inc. This followed on DOE's earlier issuance of authority to Sabine Pass to export a like volume of natural gas to free trade agreement countries on September 7, 2010. A notice of the non-free trade agreement export application was published in the Federal Register and the public was provided 60 days to intervene and/or protest the application.

Sabine Pass' non-free trade agreement export application sought authority to export the equivalent of up to 2.2 billion cubic feet per day (Bcf/d) of natural gas, equivalent to about 3.3 percent of current domestic consumption. In its application, Sabine Pass pointed to several economic and public benefits likely to follow on a grant of the requested authorization, including:

—Creation of several thousand temporary and permanent jobs, both through direct and indirect job formation; and
—Improvement in U.S. balance of payments valued at approximately $6.7 billion from LNG exports and the impact of increased production of natural gas liquids.

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[1] EIA, Natural Gas Gross Withdrawals and Production, Release Date: October 29, 2011 http://www.eia.gov/dnav/ng/ng_prod_sum_dcu_NUS_a.htm

[2] The November 2011 contract price as of October 24, 2011, was $3.60 per million Btu.

Additionally, Sabine Pass addressed the question of the domestic need for the gas to be exported; the volume of domestic supplies; and the likely impact of the proposed exports on natural gas prices. To this end, it included with its application several economic and technical reports indicating that any increase in natural gas prices from the proposed exports would be relatively modest and not detrimental to domestic energy security.

Sabine Pass's application was opposed by the Industrial Energy Consumers of America and the American Public Gas Association. Those groups challenged Sabine Pass' claims of economic benefits and no detrimental impact on domestic energy security. However, neither opponent of the application introduced economic or technical studies to support their allegations.

DOE closely analyzed the evidence introduced by the applicant and by those opposing the application. Mindful of the statutory presumption favoring a grant of the application, the agency found that:

—The studies introduced by applicant indicated LNG exports will result in a modest projected increase in domestic market price for natural gas, which reflects the increasing marginal costs of domestic production; and

—The public record supported the conclusion that the requested authorization will yield tangible benefits to the public whereas the allegations of negative impacts submitted by interveners opposing the application were not substantiated on the record. In particular, the interveners failed to offer any rebuttal studies of natural gas supply, demand and/or price analysis to support their claim the application was not consistent with the public interest.

Following a review of the record in this proceeding, DOE concluded that the opponents of the application had not demonstrated that a grant of the requested authorization would be inconsistent with the public interest, and DOE granted the requested authorization subject to several terms and conditions.

PENDING LNG EXPORT APPLICATIONS

As indicated above, applicants are increasingly seeking authorization from DOE to export domestic supplies of natural gas as LNG to higher priced overseas markets. The Natural Gas Act favors granting applications to export to non-free trade agreement countries unless it can be demonstrated that a proposed export is inconsistent with the public interest. In the case of exports of LNG to free trade agreement countries that require national treatment for trade in natural gas, DOE is without any authority to deny, condition, or otherwise limit such exports.

Mindful of the growing interest in exporting domestically produced LNG, DOE recognized in the Sabine Pass order that the cumulative impact of Sabine Pass and additional future LNG export authorizations could pose a threat to the public interest. DOE stated that it would monitor the cumulative impact and take such action as necessary in future orders.

DOE presently has before it four long-term applications to export lower-48 domestically produced LNG to countries with which the United States does not have a free trade agreement that requires national treatment for trade in natural gas. The volumes of LNG that could be authorized for export in these non-free trade agreement applications, including the 2.2 Bcf/d authorized for export in Sabine Pass, would total 6.6 Bcf/d, which represents 10 percent of total current domestic natural gas daily consumption in the United States. Consistent with the Natural Gas Act, DOE already has granted authorization from these five facilities to export this same volume to free trade agreement countries.

In order to address the potential cumulative impact of a grant of the pending applications, DOE has commissioned two studies: one by the EIA and the other by a private contractor. Taken together, these studies will address the impacts of additional natural gas exports on domestic energy consumption, production, and prices, as well as the cumulative impact on the U.S. economy, including the effect on gross domestic product, jobs creation, and balance of trade, among other factors. We anticipate that these studies will be completed in the first quarter of calendar year 2012. In this regard, we are mindful of the need for prompt action in each of the proceedings before us. However, we believe that a sound evidentiary record is essential in order to proceed to a decision and that the studies being undertaken are important elements of such a record.

CONCLUSION

I am happy to answer any questions that you may have.

The CHAIRMAN. Thank you very much.

Mr. Wright.

STATEMENT OF JEFF C. WRIGHT, DIRECTOR, OFFICE OF ENERGY PROJECTS, FEDERAL ENERGY REGULATORY COMMISSION

Mr. WRIGHT. Chairman Bingaman, Ranking Member Murkowski, members of the committee, my name is Jeff Wright. I'm the Director of the Office of Energy Projects at the Federal Energy Regulatory Commission and the views I express are my own and not those of the Commission or any individual Commissioner.

The Office of Energy Projects is responsible for, among other things, the authorization and oversight of the construction and operation of onshore and near shore liquefied natural gas terminals pursuant to Section 3 of the Natural Gas Act or Natural Gas Act.

Today I'll discuss the process which the Commission uses to review applications for facilities for the export of LNG. With respect to LNG, the Commission is an environmental and safety regulatory agency. The Commission does not authorize the import or export of the commodity. That authority rests with the Department of Energy. Accordingly applications for the construction and operation of facilities necessary to perform such imports or exports must be submitted to the Commission.

The Commission's review process is the same for either LNG import or export facilities. It is comprised of 3 phases: Pre-filing review, application review and post authorization review. Each stage of the review process requires the submission of detailed information that involves a review and consultation with key stakeholders and other Federal agencies such as the Coast Guard and the Department of Transportation.

Prospective applicants seeking Commission authority to construct and operate an LNG terminal are required under Section 3(a) of the Natural Gas Act to participate in a pre-filing process for a period of at least 6 months. This is the beginning of the Commission staff review. It involves not only an early analysis of the project proposal, but also provides a transparent forum for consultation and discussion.

The pre-filing process is designed to engage all stakeholders in order to identify and resolve potential issues related to the construction and operation of a facility before the filing of the formal application. During this process issues are raised throughout the environmental scoping process and/or other means such as open houses, public meetings, site visits or filed comments. At this stage information needs are identified and studies are conducted as necessary to fill data gaps.

Once the formal application has been filed any interested person may intervene in Commission proceedings. Interveners become participants in the proceeding and have the right to request re-hearing of Commission orders and seek relief of final agencies actions in the U.S. Circuit Courts of Appeal. In addition all interested parties have the opportunity to place their concerns regarding a project into the record and file any evidence they feel is important for the Commission to consider.

During the application phase the Commission staff reviews the formal application. Once sufficient information to address environ-

mental and safety issues exists in the record, establishes a schedule for the production of the environmental review document.

The environmental document is issued for public comment and comments received on that document are addressed. The final environmental document contains staff's conclusions regarding the safety and environmental impacts associated with the proposed facilities. The document also includes any recommended measures for ensuring safety and mitigating any environmental impacts identified through analysis, other proposals and consideration of concerns raised during the pre-filing and application review.

After issuance of the final environmental document the Commission considers the entire record of the proceeding. If the Commission finds that the environmental and safety impacts from the construction and operation of the LNG facility are acceptable and authorizes the proposal, the project specific mitigation measures recommended in the environmental document are included as conditions to the authorization.

During the post authorization review phase detailed plans for the Commission required mitigation are developed. Approval of these detailed plans must be received before any construction may commence.

During the construction period mitigation measures are implemented and monitored. As part of its ongoing post authorization reviews staff inspects the construction and progress to ensure all required measures are implemented.

Construction inspections review quality assurance and quality control plans, non conformance reports and commissioning plans to ensure that the installed design is consistent with the safety and operability characteristics of the proposal approved by the Commission.

Finally at the end of the construction, the project sponsor will file a request for authorization to commence operation of the facility. This final request will not be granted unless all measures to ensure safe and secure operations and the necessary environmental protections are in place and serving their intended purpose. Once the facility is placed in service it is subject to inspections by Commission staff for the life of the facility. This ensures that the facility will continue to be operated and maintained in accordance with the Commission's original authorization.

This concludes my testimony. I'll be happy to answer any questions you may have.

[The prepared statement of Mr. Wright follows:]

PREPARED STATEMENT OF JEFF C. WRIGHT, DIRECTOR, OFFICE OF ENERGY PROJECTS, FEDERAL ENERGY REGULATORY COMMISSION

Mr. Chairman and Members of the Committee:

My name is Jeff Wright and I am the Director of the Office of Energy Projects (OEP) at the Federal Energy Commission (FERC or Commission). I appear today as a Commission staff witness speaking with the approval of the Chairman of the Commission. The views I express are my own and not necessarily those of the Commission or of any individual Commissioner.

The Office of Energy Projects is responsible for the licensing, administration, and safety of non-federal hydropower projects; the certification of interstate natural gas pipelines and storage facilities; and the authorization and oversight over the construction and operation of on-shore and near-shore liquefied natural gas (LNG) terminals. Thank you for the opportunity to appear before you today to discuss the

process which the Federal Energy Regulatory Commission uses to review applications for facilities for the export of LNG.

With the creation of the Department of Energy (DOE) in 1977, Congress directed all applications for authorization for the exportation or importation of natural gas to or from a foreign country to be submitted to the Secretary of Energy.

In accordance with the Natural Gas Act and 15 U.S.C. Part 717, no entity may import or export natural gas without first having secured an order from the DOE authorizing it to do so. The Secretary of Energy subsequently delegated to the Commission the authority to approve or deny applications for the construction and operation of those facilities used for the import or export of natural gas.[1] This delegation was most recently re-affirmed in 2006 by DOE Delegation Order No. 00-004.00A.

With respect to LNG, the Commission is an environmental and safety regulatory agency. The Commission does not authorize the import or the export of LNG as a commodity; that authority was retained by the DOE. Accordingly, applications for authority to import or export the commodity of natural gas must be submitted to the DOE, while applications for the construction and operation of the facilities necessary to perform such imports or exports must be submitted to the FERC.

The FERC requirements for filing an application for the authorization of LNG import or export facilities are located in Title 18, C.F.R., Part 153. Section 153.6 requires an applicant to state whether DOE authorization for the import or export of natural gas is required and whether DOE has granted the required authorizations. Section 3 of the Natural Gas Act (NGA) states that the importation of LNG is consistent with the public interest. Section 3 also provides that LNG exports to countries with which the United States has executed a free trade agreement are in the public interest. In those situations where applicants are seeking to export (or import) LNG to non-free trade agreement countries, Section 3(a) of the NGA requires the DOE to make a determination on whether such exports (or imports) will not be consistent with the public interest. The Commission's review process is identical for either LNG import or export terminals. This process is comprised of three distinct phases: pre-filing review, application review, and post-authorization review. Each stage of the review process requires the submission of progressively more detailed information and involves an exhaustive review and consultation with key stakeholders and other federal agencies such as the U.S. Coast Guard and the U.S. Department of Transportation. How these phases build upon each other is described below.

Section 311 of the Energy Policy Act of 2005 requires prospective applicants seeking Commission authority to construct and operate an LNG terminal to participate in the Commission's Pre-Filing Process for a period of at least six months. This is the beginning of the Commission staff review and it involves not only an early analysis of the project proposal, but also provides a transparent forum for consultation and discussion among participants in the process (namely, the prospective applicant, FERC staff, affected landowners, other federal agencies, state and local entities, and the public). The Commission's Pre-Filing Process is designed to engage all stakeholders at the earliest point to identify and resolve potential issues related to the construction and operation of a facility before the filing of a formal application. During this process, project-specific issues are raised through the environmental scoping process and/or other means, such as open-houses, public meetings, site visits, or filed comments. Information needs are identified and studies are conducted as necessary to fill data gaps. The end of the Pre-Filing Process occurs when the applicant files its formal application.

Once the formal application has been filed, any individual or organization has the option to intervene in the Commission proceeding. Intervenors become participants in a proceeding and have the right to request rehearing of Commission orders and seek relief of final agency actions in the U.S. Circuit Courts of Appeal. In addition to intervention, all interested entities have the opportunity to place their concerns regarding the project into the record and file any evidence they feel is important for the Commission to consider,

During the application review phase, the Commission staff reviews the formal application and, once sufficient information to address environmental and safety issues exists in the record, establishes a schedule for the production of the environmental review documents. The environmental document is then issued for public comment, and comments received on that document are addressed.

The final environmental document contains staff's conclusions regarding the feasibility, safety, and environmental impacts associated with the proposed facilities. The document also includes any recommended measures for ensuring safety and miti-

[1] DOE Delegation Order No. 0201-112. Federal REgister, 49 Fed. Reg. 6684 (1984).

gating any environmental impacts identified through analysis of the proposal and consideration of concerns raised during the pre-filing and application review.

After issuance of the final environmental document, the Commission considers the entire record of the proceeding. If the Commission ultimately finds that the environmental and safety impacts from the construction and operation of the LNG facility are acceptable and authorizes the proposal, the project-specific mitigation measures recommended in the environmental documents, and any others identified by the Commission as necessary, are included as conditions to the authorization.

Development of the information and the consultation required by these mitigative measures are the subject of the third phase of the Commission's process: post-authorization review. It is during the post-authorization review phase that detailed plans for the Commission-required mitigation are developed. Approval of these detailed plans, and the specified conditions of an order, must be received before the Commission's second authorization, the authorization to commence construction, will be issued. Authorization to commence construction will not be issued until the conditions requiring pre-construction approval have been satisfied, with input as appropriate from all named agencies and other parties.

During what is typically a multi-year construction period, mitigation measures are implemented and monitored. Frequently during this period, on-the-ground conditions are identified that require modifications of the mitigation plans that were developed prior to the start of construction. As part of its ongoing, detailed post-authorization project review, staff inspects the construction in progress, as do third-party inspectors, ensuring that all required measures are implemented.

FERC staff's inspections during construction entail the review of quality assurance and quality control plans, non-conformance reports, and cool down and commissioning plans to ensure that the installed design is consistent with the safety and operability characteristics of the proposal approved by the Commission. Finally, at the end of construction, the project sponsor files a request for authorization to commence operation of the facility.

The information contained in this request must demonstrate how the project sponsor has complied with all of the Commission requirements and must be consistent with the results of the Commission's inspections. This final authorization from the Commission will not be granted unless all measures to ensure safe and secure operations, and the necessary environmental protections, are in place and serving their intended purpose.

Once a facility is placed in service, it is subject to continuing inspections by FERC staff for the entire life of the facility. This ensures that the facility continues to be operated and maintained in accordance with the Commission's original authorization.

This concludes my testimony. I will be happy to answer any questions you may have.

The CHAIRMAN. Thank you very much. Let me start with a few questions.

Mr. Smith, let me start with you first of all. What I understand of your position or your authority is there in the Department of Energy, when there is an application to export natural gas to a country that we do not have a free trade agreement with, there's a rebuttable presumption that that is in the public interest, that export of natural gas. But you have the ability to hold a hearing and determine that it's not in the public interest, as I understand it.

Am I right about that so far?

Mr. SMITH. Thank you, Senator, for the question.

Yes, that's fundamentally correct. When we get an application that's for a non free trade country, the requirement that the Department of Energy has is to make a determination of public interest for that particular application. So if it is not determined that going forward and approving that application is not in the public interest, then that particular application would be approved.

The CHAIRMAN. OK. You also indicate here that you've got various applications pending and that the combined volumes of LNG that would be authorized for export under those would represent 10 percent of total current domestic natural gas consumption in the

United States. That consistent with the Natural Gas Act you have already granted the authorization for these 5 facilities to export this 10 percent of the natural gas—or volume that represents 10 percent of what we consume in this country.

Is that all accurate?

Mr. SMITH. Senator, that is correct. So there's, as we mentioned there's 2 types of applications, one to free trade and one to non free trade countries.

The CHAIRMAN. Right.

Mr. SMITH. So given that the applications to free trade countries by statute we're required to authorize without delay or modification, those have already been authorized consistent with the Natural Gas Act.

The CHAIRMAN. OK. Now as to when you make your determination as to whether there is any problem with going ahead with these permits for the non free trade countries and your determination of whether the public interest is adversely affected is, to a substantial extent, dictated by what you think is going to happen to price. Is that accurate?

Mr. SMITH. Price is one factor that we consider. So when we're looking at the public interest determination we consider a very wide range of factors.

We look at impact to the local economy.

We look at impact to GDP.

We look at creation of jobs.

We look at energy security and supply.

We look at impact on price and the impact that price may have on—price changes may have on other industries.

So we're taking a comprehensive look that considers price, but also considers the broad range of impacts that LNG exports might bring to our economy.

The CHAIRMAN. OK. I notice we have a report from the Congressional Research Service that was just completed. It says in its summary here, a significant rise in U.S. natural gas exports would likely put upward pressure on domestic prices but that the magnitude of any rise is currently unclear.

You indicate you have some studies going that are going to clarify how much of a price change could result from these increased exports. Is that accurate?

Mr. SMITH. Yes, sir. So as we look at the studies that are currently underway we have a study that's before EIA which is going to be looking at what would be, potentially, the increase in prices that would come from an incremental increase in demand that would be represented by the LNG exports.

We are also looking at an external contractor, who will take that as an input and then based on that potential price increase what would be the overall net impact to our economy including economic activity increase and jobs, balance of trade, etcetera.

So those are the 2 studies that we have ongoing currently that we expect results that will lead to——

The CHAIRMAN. If we deny export permits to export to non FTA countries because of expected impacts on our domestic prices for natural gas, does this violate the World Trade Organization agreements we've entered into?

Mr. SMITH. Senator, I'd actually have to respond to that question for the record. But I can give one clarification that the public interest determination is a broader determination than just the impact on price. So it would be looking at a broad range of factors, include all the other economic and security of supply issues that we would be concerned about in terms of public interest.

The CHAIRMAN. Alright.

Senator Murkowski.

Senator MURKOWSKI. Thank you, Mr. Chairman.

Mr. Smith, continuing with you. It would seem that one of the determining factors when we're looking at capacity for export would be the size of the gas resource. You've got a whole host of different entities out there. You mentioned EIA, but you've got MIT, PGC, ICF. Who does the DOE rely on in terms of assessing the resource?

Is there an entity that you turn to?

Mr. SMITH. Thank you, Senator, for that question. So as you note there's a wide range of opinions in terms of the size of the natural gas resource. Certainly the first resource that we rely on is the EIA estimate in terms of the size of natural gas resources.

The EIA came out with a study earlier in this year that took the shale gas estimated resource in the United States from somewhere in the order of magnitude of 400 TCF to over, I believe, 800 trillion cubic feet. That was one of the larger single year increases in reserve assessments that EIA has evaluated. That's a figure that's roughly in line with many of the other studies that you cite.

Senator MURKOWSKI. Is it accurate that these estimates don't contain any of the undiscovered gas whether it's in places like Alaska or the Antrium and the Utica shales?

Mr. SMITH. I know that the EIA considers all of those factors in various resource estimates. The number that I just quoted just now refers to shale gas resource estimates. So I'm not sure that includes some of the undiscovered gas.

Senator MURKOWSKI. I don't think it does the undiscovered.

We had some, hopefully, what we consider to be good news this past weekend. Escapeta had an announcement in the Cook Inlet of what we hope to be some substantial reserves of natural gas. We've been exporting again out of Cook Inlet now for about 40 years.

Do you consider that Alaska's resource base and its geography place it in a unique position in terms of possible export options?

Mr. SMITH. Thank you for the question, Senator.

Certainly Alaska has a very attractive resource base, one that's, of course, of interest to the Department of Energy and a lot of the work that we do. I would say that in terms of the future potential for exports or what direction exports will take that's very likely going to be a direction that's determined by the market. There are a number of factors that go into that determination.

So should there be an export opportunity from Alaska the process that we follow here would be the same process as the process that we've outlined here in my earlier comments. In addition to that, there are some stipulations in the Alaska Natural Gas Transportation Act for North Slope gas that the Department of Energy would also be compelled to consider.

Senator MURKOWSKI. One last question then I'll go to Mr. Wright here.

Is it accurate that the licenses for LNG export are focused or concerned with dry gas as opposed to the natural gas liquids that are used for feed stock?

Mr. SMITH. So the exports for LNG would be coming from LNG that—the natural gas that actually goes into the LNG process. So we're not looking with these export applications at export of anything other than natural gas that's been converted to, through this cryogenic process to LNG for export in the LNG market.

Senator MURKOWSKI. Thank you.

Mr. Wright, you had indicated in your testimony that the process is the same for either LNG import or export terminals when you do the review. Can you clarify for me if is it possible for a terminal to go through both reviews, both for an export and for an import terminal? How easy is it to switch back and forth?

Mr. WRIGHT. Thank you, Senator.

If we're talking first about an existing import terminal the process is fairly simple.

Senator MURKOWSKI. So if there was an expansion of that terminal you're saying it would be relatively easy?

Mr. WRIGHT. Yes. If the terminal were in operation, the tanks were there. The berths were there for the ships. All that we'd need to be added on would be refrigerant, pumps, things to make the gas into liquid and be loaded onto the boats.

I don't want to say it's simple. But it's a lot better. It's a lot shorter process than if you were starting on a complete green field operation.

If you were starting from scratch and you didn't have anything there. You're talking probably a construction period of around 3 to 4 years. The critical path being the construction of the LNG storage tanks which is the longest piece of equipment time taking that needs to be installed.

Senator MURKOWSKI. But you can go back and forth in terms of a review process. The procedure that you have in place allows for that.

Mr. WRIGHT. Yes.

Senator MURKOWSKI. OK. Thank you, Mr. Chairman.

The CHAIRMAN. Senator Wyden.

Senator WYDEN. Thank you, Mr. Chairman.

I want to get into a little different area, gentlemen. I come to this debate really with 2, sort of, fundamental principles.

First, I've been a strong supporter of natural gas. Will continue to be. It's exceptionally important to American industry whether it's paper, steel, autos, a whole host of companies. Obviously to scores and scores of our consumers, who depend on natural gas to heat their homes.

But second, we have seen a dramatic development, which my colleagues have talked about, and that is the rapid expansion and conversion of these import facilities into export facilities. That means that in the future North American natural gas prices are going to be tied to world natural gas and oil prices. Of course, the old saying is a picture illustrates just about everything.

I want to just show a picture that came from the Wall Street Journal recently. It's really a chart. It's titled, Asia calling, published 2 weeks ago in the October 27th edition of the Wall Street Journal.

The red line is the spot price for LNG in Asia. The green line is the natural gas futures prices for us here in the United States. So it's very understandable why North American natural gas producers would want to build LNG export terminals so they can sell natural gas to Asia and other overseas markets at 4 or 4 times the prices here. What's less clear is how this is going to be beneficial for our businesses and our consumers who are going to have to compete with these prices.

So let me start with you, Mr. Smith, with a question. In your decision to approve the first big LNG export terminal, this is the Sabine facility, DOE accepted the applicant's analysis on the impact that just this one terminal would have on U.S. natural gas prices. That analysis which DOE cited in its own approval concluded that just this one terminal would raise U.S. natural gas prices by more than 10 percent in 2015 and by more than 7 percent as far out as the year 2035.

Now since then, DOE and the National Energy Board in Canada have either approved or received applications for LNG exports that total almost 5 times the amount of exports DOE first approved for Sabine or just under 13 percent of current, daily North American demand. So clearly the Department believes that raising natural gas prices by 10 percent meets the public interest test required by the Natural Gas Act.

My question is does the Department believe that raising natural gas prices by 5 times that amount would be in the public interest?

Mr. SMITH. Thank you very much for the question, Senator.

So I'll touch on a couple of points here. When the public interest determination was made for the Sabine Pass application, Sabine Pass, when they were—when Cheniere was putting forth their application, they did include some studies which gave some estimates. Those were studies that were entered into the public record and those were the studies that you are referring to in your comments.

Natural gas itself is a very volatile commodity inherently. Historically if you look at the price volatility of natural gas we've seen a dramatic decrease in natural gas prices over the last several years because of an increase in supply. The estimate for 2015 and 2030 would be a potential increase in gas prices over a base case based on an incremental demand. But again, those were studies that were put forward by the applicants.

So as we go forward and we look at the non free trade applications that we're currently considering, the Department of Energy will be doing a broader public interest determination that will look at a more fine model that looks at impacts potentially on price and on all the other factors.

Senator WYDEN. My time is short.

I'm trying to get my arms around where the Department is going to draw the line. I mean, given the fact that prices overseas are many times higher than North American prices, my question really deals with how high do you think the price of natural gas in the United States can go up as a result of these exports and still meet

the public interest test? Is there anything else you can tell me about how the Department is going to draw the line here so that we can tell American businesses and American consumers that they're going to be able to get affordable natural gas in light of this new export policy?

How is this line going to be drawn?

Mr. SMITH. Thank you, Senator.

So when we look at the public interest determination it is going to be multi-factorial. I can't give a number for one factor simply because when we're looking at what's in the public interest we're going to be looking at impact on GDP. We're going to be looking at impact on jobs. We're going to be looking at impact on the balance of trade.

Some of those factors will be impacted by price itself. So we understand the importance that price holds. We also understand that natural gas at these export levels, it remains an inherently local, domestic commodity.

Prices are higher in Asia, but if you look at the—if you compare say natural gas with oil. Oil is the globally fundable commodity in which you've got enough transportation infrastructure to move oil from market to market. Whereas the ability to couple prices in the United States with prices in Asia simply there's not the infrastructure that would allow you to do that at this point in time.

Senator WYDEN. My time is up. Exports in the United States are going to make natural gas like the oil market. That's why I'm concerned about what these price hikes could mean for our businesses and our consumers.

Mr. Chairman, thank you.

The CHAIRMAN. Thank you.

Senator Corker.

Senator CORKER. Thank you, Mr. Chairman.

You all the most polite witnesses we've had in a long time. Thank you so much.

Mr. Smith, do you believe what Senator Wyden just said is true? That over time with the, you know, expansion of exports that we will actually be at prices that are equal to the spot market in Asia. Do you believe that to be true or not true?

Mr. SMITH. That's going to be subject of our studies. So the, you know, as we look at the public interest determination we're going to make sure that we're quantifying these questions, that we're understanding them in detail. So the answer to that question is going to be revealed by these in-depth studies that we are undertaking so that we understand the impact of any given LNG export application. That we understand what truly is in the public interest before we authorize.

Senator CORKER. What are the cost factors in converting natural gas to LNG and transporting to Asia? I mean, give us a relative increase of cost of actually, to the producer, in doing that.

Mr. SMITH. Senator, I'm just not going to know that fact off the top of my head. I'm sorry.

Senator CORKER. I guess our next panel will do that.

Mr. SMITH. I could add to that for the record.

Senator CORKER. OK.

Let me, as you all look at overall—first of all I can understand why people who produce natural gas would want to seek the highest price available to them as long as, from their perspective, why they would want to do that. I understand that. I think we all understand that.

Let me ask this question though. As far as our own U.S. consumption, at what point are there trends where you see, even in spite of the tremendous amount of production that is taking place in this country, thankfully. Is there a place where our usage actually at some point out in the future 10 or 20 years will be greater than the amount we're producing? Where this reverses again like it has in the last 5 years?

Mr. SMITH. Again, Senator, I think the detailed answers to a lot of those questions about what's going to happen in the future, what's going to happen after the potential authorization of various exports. That's going to be a hypothetical which we're going to be able to answer within more detail as we go forward. We conduct our studies.

But these are the types of questions that we are looking at answering as part of the public interest——

Senator CORKER. You deal in this every day. I mean, what's your sense of the demand/supply issue in our country over the next 20 years?

Mr. SMITH. Certainly over the next 20——

Senator CORKER. Just your sense.

Mr. SMITH. Over the 20 years I think if you look at the EIA figures and other independent figures you'd say that we'd certainly be in a position of oversupply for 20 years, for that period of time that we'd be looking at having natural gas from shale gas resources to supply our economy making the assumption and something that we have to confirm and that we have to ensure that we produce that resource in a way that's environmentally sustainable and safe.

Senator CORKER. So again, if you would, just what are the—when you look at the public interest in trying to determine the permitting of additional export facilities what are some of the other public interest issue that you look at other than just the price of the commodity itself?

Mr. SMITH. Our job is to look at all things that impact the public. So the primary ones that we've talked about today would be impact in price, impact on economic activity, impact on balance of trade, impact on security of supply and national security, impact on creation of jobs, all the things that would impact our economy and our society.

Senator CORKER. You know, it's interesting we're having this hearing. I thank both of you for coming and for your testimony. So here we have a situation in our country where fortunately we've found tremendous reserves of natural gas. We're actually exporting. I think that's a place that all of us are really glad to be and hopefully over time even more natural gas usage within this country because of such an abundant resource.

Yet at the same time, on the flip side, in both of your departments, I guess, we aren't opening up enough crude oil exploration to really offset the balance on the other side. I'm wondering if you all ever discuss what a dichotomy that is here in our country where

on one hand we have this wonderful situation with natural gas that hopefully stays for a long, long time. On the other hand, we do everything we can to, in many ways, to keep from making more crude oil available.

Do you all have any comments in that regard?

Mr. SMITH. Senator, I can make one comment. You know, within the Department of Energy if you look at the goals and the mission of the Department of Energy, particularly with regards to natural gas with oil, our Department's mission is specifically geared toward ensuring the environmental sustainability and safety of deep water exploration production all the way through shale gas.

If you look at the key factor that's going to ensure that we're able to produce this resource in a way that's sustainable and a way that creates value and that prudently develops a resource. It's going to come down to being able to do it safely because we're producing these resources on the backyards where people in live, in communities where people go to school, where they work.

So the work the Department of Energy is working on currently in this area is to make sure that we listen to communities. We understand what the concerns of communities are, that we're addressing those concerns through good science. So as we go through regulatory process of ensuring that we're mitigating risks through good rulemaking, that those rules are based on risks that have been appropriately scientifically qualified and that we understand that we're communicating in 2 directions with communities and can show that we're doing this well.

We truly believe that's going to be a critically important thing to do to make sure that we're able to get the full benefit out of our resource base. That's a mission that we're working on right now on a daily basis.

Senator CORKER. Thank you, Mr. Chairman.

The CHAIRMAN. Senator Coons.

Senator COONS. Thank you, Mr. Chairman. Thank you for calling this hearing and for an opportunity to have a dialog with these great witnesses.

So Secretary and Director, I just would be interested in continuing along the line of the questioning that Senator Corker was just on. Obviously natural gas is and always will be very important to the manufacturing and the chemical industries in the United States. But it is also now emerging as a great resource for the United States both with job creation and wealth creation and potentially an export opportunity as we're now the world's leading natural gas producer.

But when we've had some, I think, some conflicting signals from the Energy Information Administration and the National Petroleum Council about how abundant is the supply, for what timeline, what will the pricing look like? I have some questions about how you will take into account the potential economic impact for some of our core industries here at home should licensing of export begin.

So, do you have a sense of—have you looked at whether there's enough natural gas to answer the whole range, the whole diversity of likely or potential demands within the United States for it. Is

there a regional difference in this country in terms of export potential given infrastructure questions?

Then second, if I might, is it a greater benefit to be exporting a raw material, like natural gas, or finished materials like chemicals or higher value goods that have been made possible by the use of that natural gas in refining manufacturing or chemical production here in the United States?

Mr. SMITH. Thank you, Senator, for that question.

Some of the factors that you're asking about in terms of eventual impacts on price and what's the size of the resource base and is there going to be enough to supply? Those are going to be issues that we are addressing in the public interest determination. I mean that's at the core of what we need to understand in a very detailed way.

I would say that there's already a tremendous amount of data out there that points to the size of the resource base and the years of supply that we have in terms of shale gas. If—we have not only the information we've gotten from the EIA and our private studies but also there is recently a National Petroleum Council study that was commissioned by Secretary Chu which specifically focused on to what degree can natural gas contribute to some of our energy sustainability goals if it's prudently developed.

So those are all factors that we take into account when we're looking at these public interest determinations. In terms of your second question on would we prefer to be exporting natural resources or exporting finished goods, that would be, I think it's a question that would be outside of my, you know, my personal subject matter expertise. That would be a question we could take for the record.

Senator COONS. Certainly.

There is also a number of countries, Poland, Argentina, China, I believe that are proceeding fairly rapidly with exploration development of shale gas. There may be many others in the future. I know the evolution of a global marketplace is something like gas is difficult to predict, but are you taking the impact of a potentially large overseas developments into account as you're developing your pricing models and as you're doing that public benefit calculation?

Mr. SMITH. Those are things we do take into account.

In fact the Department of Energy does work with other countries. We're looking not only at, you know, the—potential for exporting LNG which is the purpose of this hearing. But here's also an opportunity for American innovators and American companies to export the technology itself.

We're working, you know, hand in hand with companies and with our counterparts in—from Brazil to China to look at ways in which we can create opportunities for American companies which also is going to increase the global supply of natural gas which I think potentially would have a downward impact on prices around the world.

Senator COONS. Great. Thank you very much.

Thank you, Mr. Chairman.

The CHAIRMAN. I was told Senator Hoeven came in next. Is that right or is it Senator Barrasso?

Senator HOEVEN. Senator Barrasso.

The CHAIRMAN. Senator Barrasso, go ahead.

Senator BARRASSO. Thank you, Mr. Chairman. Thank you for holding this hearing. It gives us another opportunity to consider the developments in the American natural gas market. You know, I think it is safe to say and all of us would agree that the developments that we've seen in the last decade are nothing short of extraordinary. I mean, the very fact that we're having a hearing to focus on American LNG exports really says it all.

Less than a decade ago the United States was preparing to become a major importer of LNG. Now with the growth of America's natural gas supply there's interest in exporting American natural gas in the form of LNG. Of course, Alaska has been doing this since, as our Ranking Member has said, for a long time, actually I think back to 1969.

But now the proposal is to export additional LNG come from the lower 48. The proposals raise several important questions, specifically what are the costs and what are the benefits of new LNG exports? Will the new exports affect consumers such as families trying to pay their heating and electricity bills, companies deciding whether or not to invest in the United States? We all must ask whether new LNG exports will affect the incentives for America's natural gas producers and revenues to local and State governments as well as the Federal Government.

Finally we need to ask whether the new LNG exports would impact American energy independence. You know, on Friday David Brooks wrote a column in the New York Times entitled the Shale Gas Gas Revolution. Don't know if you've had a chance to take a look at that, Mr. Chairman. I'd like to actually introduce a copy of that article by David Brooks for the record.

Talks about the significant impact and the significant changes in just in the last decade. So when I think about what Senator Wyden said. He said, you know, where's the Department going to draw the line? I think that's the basis of a lot of the discussion and the questions.

For Mr. Smith, I know you've answered some of this and I just want to try to fine tune some of the things that you've talked about because you did talk about the Department of Energy commissioning the 2 studies to consider the potential cumulative impact of pending LNG export applications. I think you talked a little bit about the one study being done by the Energy Information Agency and then also the other by the private contractor and how you were going to blend those together.

How do you, specifically, how do the criteria for the 2 studies kind of compare to the criteria used by the Department in the public interest review process for individual LNG export applications when you try to take a look at the cumulative impact?

Mr. SMITH. Thank you, Senator, for that question.

So the criteria is going to be fundamentally similar except for as we're now considering a number of applications and the total volume, you know, the total maximum volume for all the applications we're considering now is around 6.6 billion cubic feet per day. It becomes a larger and more detailed, more complicated question, a more complicated equation. So the Department made the decision that we did have to have a more precise process, that we had to

make sure that we quantified some of these things in a way that was open and transparent and helped us make sure that we're taking into account all the factors that we're concerned about.

Senator BARRASSO. You talked in your testimony about the impact on the public, on consumers, on how it affects industry and the implications throughout. When you go through the public review, the public interest review process, you're going to consider the impacts on it said, mineral interest owners when they can be private owners.

They can be State governments and then the Federal Government, who has a significant impact and ownership of the mineral interest. Will the studies consider the impacts of those mineral interest owners because there are impacts in terms of tax consequences, of income to the government and in terms of our overall economic situation.

Mr. SMITH. You know, in terms of value for producing those incremental BTUs of gas for export those would all fall into the scope of the study.

Senator BARRASSO. Any insight into whether LNG exports might provide long term stability to price of American natural gas. I mean, we saw the numbers that Senator Wyden put up in terms of the world market, in terms of, you know, families dealing with prices, businesses trying to make decisions because there's been quite a bit of flexibility and fluctuation in the price on the market.

Mr. SMITH. Alright. Again, Senator, those would all be factors that we'd consider in the study. Price volatility, price levels, what impact it would have on consumers and what impact it would have on businesses, those would all be factors that would be of interest in making the public interest determination.

Senator BARRASSO. OK. Thank you, Mr. Chairman.

The CHAIRMAN. Thank you.

Senator Manchin.

Senator MANCHIN. Thank you, Mr. Chairman. Again, I think this is a very informative meeting. I would ask I guess, Mr. Smith, to you.

Do you believe and Mr. Wright also with FERC, do you believe that the United States could become energy independent with all the new resources that we're finding with the oil that we have that's been developed and undeveloped and natural gas that we're finding now with all the value added to that and also our coal and everything that we have. Do you believe if we had a good energy policy we could be energy independent and not relying on foreign oil?

Mr. SMITH. Yes. Thank you for that question, Senator.

That is probably a question of breadth and scope that would go beyond.

Senator MANCHIN. You would know the volumes of resources that we have, sir, in your position and also in your prior position. Do you not believe if we had an energy policy that used all of our resources that we could be energy independent?

Mr. SMITH. Again, Senator, I understand the question. But in terms of being able to take what we can quantify and declare at this moment and make a determination one way or the other on a hypothetical question.

Senator MANCHIN. You know we have enough resources, correct? Would that be fair to say?

With the new find of natural gas now, you have the Marcellus and Utica shale and what we have going on in our fossils that we have and our oil that we have, our deposits. If you utilized that in the most balanced, economic, environmental way, you mean, you don't have an opinion on that?

Mr. SMITH. Senator, I would say that we can observe through the figures and production figures and resource figures that we do have an oversupply in the current term of natural gas. So that oversupply of natural gas is creating an opportunity to export natural gas to other markets.

In terms of how the natural gas resource combines with oil and all the other sources of energy that we have in the United States, that's just a determination I'm not able to make——

Senator MANCHIN. Would the Department of Energy have the data to give me an answer on that?

Mr. SMITH. Yes, Senator. I'm sure that the data exists and in terms of interpreting the data to come to a conclusion about a future state that would be an exercise.

Senator MANCHIN. Do you know how much investment from foreign countries that we have right now just in a natural gas play?

Mr. SMITH. I don't know the answer to that question, Senator.

Senator MANCHIN. You don't how—you don't know who is holding these resources? Is it American solely owned companies or major investments from foreign countries that have interest?

Mr. SMITH. There have been investments from foreign companies particularly in terms of shale gas. There is an interest in the technical and operational competence that has been developed between the United States. So I know there is——

Senator MANCHIN. Let me ask you hypothetically then. If a country that has an investment needs the product that comes from, let's say the LNG, and they want to start taking it from the United States and shipping and exporting it to their country. Would they not, in a sense, control pricing of what goes on here too?

Mr. SMITH. Senator, again, I think that's a question that goes beyond something I'm going to be able to address here in this hearing.

Senator MANCHIN. How is gas traded? What's the pricing? I mean, how is gas priced?

Would it be subject to global pricing then?

Mr. SMITH. Senator, I mean, if you look at how gas is priced, for example, compared to oil. I mean, one thing we can say is that gas right now in the current global market is a fairly fundamentally local commodity. There is some ability to move natural gas from one basin into the other.

But if you look at the fungibility verses the fungibility of oil, you come to the conclusion that oil is truly a more fungible commodity than gas. You move about half of the oil goes from basin to basin because you can put it easily in a ship. There's a global fleet of about 11 to 12,000 crude tankers verses LNG that has a global fleet of in the hundreds, you know, around 300 LNG tankers.

So your ability to close arbitrage just from market to market for natural gas is considerably less than your ability to do so for oil.

Senator MANCHIN. I would like to make a formal request, if you could, with the resources that our country has, the United States of America, if it's plausible for us to be energy independent.

It's a shame that this Nation doesn't have an energy policy. That's the thing I'm saying. You're a part of the unit of the Energy Department. For us to not have, from our Energy Department, a request from this government to have an energy policy that uses all of our resources in an environmentally, economically friendly way that makes us less dependent on foreign oil.

I just find that hard to believe in the 21st century that this country can't move an energy policy that's truly independent and the price that we're paying in so many different ways on the oil that we seem to be chasing and demanding around the world. Natural gas with the play you have now with Utica, Marcellus, your fossil fuel deposits of coal and your oil and then also the renewables that are coming on strong.

If you can give me a report on that or if you have anything in house that would help me out I'd appreciate it.

Mr. SMITH. Thank you, Senator. We look forward to responding to that request.

Senator MANCHIN. Thank you.

The CHAIRMAN. Senator Hoeven.

Senator HOEVEN. Thank you, Mr. Chairman.

Director Wright, how much more gas do we produce than we consume? What's the growth path on it?

Mr. WRIGHT. I was glancing at some numbers provided by the EIA. Currently I believe we produce probably on average about 5 BCF per day more than we consume.

Going forward I don't have a prediction other than looking at their long range predictions of the Annual Energy Outlook that's put out by EIA. That tends to go to 2035. That shows that we will have adequate supplies for the demands that are expected for that timeframe.

Senator HOEVEN. But is your projection that we not only produce more than we consume now, but that will continue to grow which will not only put us in position to export as we're discussing today, but also will tend to reduce the price for natural gas, make it more—make it cheaper for our use as well.

Mr. WRIGHT. I don't predict prices and my agency doesn't. But operating on your premise that more production, more supply could dampen price levels. That is certainly plausible.

Senator HOEVEN. Where I'm going with this and I'll ask Secretary Smith the same question now. That is in our State we're drilling and producing a lot of oil in the Balkan and the Three Forks. We're working on some other geologic formations now.

But in the process we produce a lot of natural gas. Some of the infrastructure we're building. We're adding pipeline infrastructure. We're gathering systems and transportation to markets building pipeline interstate pipelines as well.

But one of the challenges we have is being able to do that as these wells are drilled primarily for oil and so we're flaring gas. So we're looking for ways to encourage the industry to capture more of this gas, build the gathering systems, build the interstate pipe-

lines and get it to markets. I would like your ideas on how we can continue to encourage that.

What things can we do to see that instead of flaring that gas we get it to market? I'm going to ask Secretary Smith the same question.

Mr. WRIGHT. From an infrastructure perspective we have over 220,000 miles of interstate pipelines, over 80,000 miles of intrastate pipelines. We have storage opportunities in this country upwards of 4 trillion cubic feet that can be stored. There's much more opportunities a, to expand the infrastructure system and the storage system where more of that gas can be actually placed in storage and used when it is needed during peak seasons.

That said, there's other ways in terms of possibly encouraging more vehicular use of natural gas, more fleet use of natural gas. It's a very small proportion of the natural gas consumption mix right now.

If you look at projections it looks like electric generation is going to consume an increasingly larger portion of the natural gas in this country. Certainly an area that could be pushed along with renewables and many studies have shown that renewables and—

Senator HOEVEN. Let me rephrase. What specifically are you doing at FERC and Secretary Smith, what specifically are you doing at Department of Energy that will help us get more of this gas captured and delivered to a market where it can be sold.

Mr. WRIGHT. Let me say that FERC is a regulatory agency. In that sense it is a reactive agency. People have to propose and we dispose.

What we do do is when people come to us with proposals for infrastructure, interstate natural gas infrastructure, under our jurisdiction we strive to get that infrastructure approved in an environmentally friendly and in a safe way. I would think if you looked from the year 2000 to present we've approved over 16,000 miles of natural gas pipelines and almost a trillion cubic feet of underground storage. So in terms of getting infrastructure in place to take gas away from the fields, I believe FERC has done—

Senator HOEVEN. So you're moving that—well you don't have a backlog and it would apply to anything that's interstate be it storage or transmission—transportation?

Mr. WRIGHT. I mean, we always have cases pending. But I believe we move things in a fairly expeditious fashion.

Senator HOEVEN. OK. Very good.

Secretary Smith, your ideas on specifically what we can do and what you are doing to get more of this gas captured and sold, marketed rather than flared.

Mr. SMITH. Senator, the point you raise is largely an issue that is a, driven by the capital decisions that companies make, independent operators make, in a market economy and is also driven by the State Regulatory agencies that determine the limits for flaring.

So the Department of Energy is a—we're a technology organization. We develop technological solutions for energy. So we have initiatives in place in which we cooperate with State level agencies to try to solve problems.

There are not a lot of things I can—that I could say that build upon Director Wright just mentioned in terms of potential solutions, the current infrastructure build out, what can be done in terms of storing gas, looking for opportunities for increasing demand for gas locally. But it would be something that I'd be interested and willing to collaborate with your staff or the folks in your State to look for additional solutions.

Senator HOEVEN. Mr. Chairman, my time is up. But Secretary Smith, if you could I would like your top 5 ideas, if you would check with the DOE.

I'd like your top 5 ideas for how we can do more to encourage industry to gather the gas and get it to market rather than flaring.

Mr. SMITH. Alright. We'd be glad to provide that.

Senator HOEVEN. Thank you.

The CHAIRMAN. Thank you all very much. We do have one or 2 other questions before we go to our second panel as I understand it.

Let me ask one question then see if Senator Murkowski does. I know Senator Wyden has a question.

Our joint staff here on the committee has given us a memo in preparation for today's hearing. It says in here most LNG imports are priced on a formula index to crude oil prices. Is that accurate, Mr. Smith?

Mr. SMITH. Yes, Chairman, that's generally accurate.

The CHAIRMAN. So the distinction when we look at the price of natural gas, the price of natural gas here in the U.S. is not indexed to world oil prices. The price of LNG imports are indexed to oil prices. Presumably the price of LNG exports are going to be indexed relative to oil prices. So we need to keep the distinction between how LNG gets priced and how natural gas gets priced in our domestic market.

Is that the key issue?

Mr. SMITH. Mr. Chairman, that's a complex issue. But I can say the general answer is that natural gas that is consumed here in the United States is going to be priced based on the natural gas market domestically. As natural gas producers in the United States are looking for opportunities to export natural gas via LNG to other markets there's going to be an evolving series of mechanisms that will determine how that will be priced.

That's as LNG becomes a more liquid, more tradable commodity that's something that's evolving. But natural gas prices say in Japan or in Korea or in other markets where this gas will be going is going to be driven by a number of factors that are fundamentally different than the factors that drive natural gas prices here in the United States.

The CHAIRMAN. Alright.

Senator Murkowski, did you have additional questions?

Senator MURKOWSKI. Yes, very quickly, Mr. Chairman.

This goes to you, Mr. Smith. Can you describe the authority that exists within DOE to deal with a situation? Say you've got a terminal and you've got a long term contract for export that has been put in place. But say you have a national security issue that presents itself.

What authorities exist within DOE to preserve the situation so that here, domestically, we're not subject to a long term contract that might jeopardize the security issue?

Mr. SMITH. Thank you for the question, Senator.

First of all, you know, a fundamental principle of how we exercise our authority under the Natural Gas Act is that the Department of Energy recognizes and values the importance of sanctity of contracts. So as we look at doing the work to authorize these export applications we're going to be judicious to make sure that the public interest determination stands up to scrutiny.

The order that was issued for Sabine Pass did include a footnote that noted that the Department of Energy, under the Natural Gas Act, under that statute, does have the authority to come back and look at issuing a clarifying order or making a change if there is fundamental change in supply and demand that would impact either security of supply for the United States, national security, our ability to supply natural gas domestically, etcetera.

So if there was something that fundamentally changed the supply and demand balance in the United States the Department of Energy would have the authority to go back and look at the order. But again, that note, that footnote in that particular order that was issued for Sabine Pass was simply restating the authority that the Department of Energy has and has been granted by the Natural Gas Act. So it's an obligation that our agency has.

Senator MURKOWSKI. Thank you, appreciate that.

The CHAIRMAN. Senator Wyden.

Senator WYDEN. Thank you, Mr. Chairman. Also, Mr. Chairman, if I could just put into the record. A number of my constituents asked that their views be entered into the record as well.

The CHAIRMAN. Yes, we obviously will enter the article that Senator Barrasso talked about and this article as well.

Senator WYDEN. Thank you, Mr. Chairman.

Just one question for you, Mr. Wright. It illustrates why Oregonians are trying to sort through this and I'm asking these questions.

Less than 2 years ago your agency approved the Jordan Cove LNG import terminal in Coos Bay over the objections then of the State of Oregon. The State argued that Northwest natural gas needs could be met with North American supplies. FERC staff, the Commission, basically told folks in Oregon, nope. The Pacific Northwest needs the imports.

So this past September, 21 months after FERC insisted that the import project was essential to meet demand in the Northwest, Jordan Cove did a complete about face. They filed an application to export even more gas, 1.2 billion cubic feet a day than FERC had previously licensed it to import. So my constituents are trying to make sense out of all this.

I think what I'd like you to do is explain this and explain after something like this they ought to be confident that you all have the ability to tackle these issues because they really can't sort out particularly what happened in Coos Bay.

Mr. WRIGHT. Thank you, Senator.

At the time that Jordan Cove proposed its project there was a need for gas in the U.S., a need that could not be met via domestic

supplies. Jordan Cove was one player in many of the players around the U.S. who thought the best idea would be to import gas via LNG. At the time of the decision, that seemed to be a good idea.

Like we've discussed here we've had a shift, if you will, in terms of the supply dynamics of the United States. The shale gas has become much more economic to produce. There's a much larger base than we ever probably conceived.

Now that is why we're probably seeing this move toward exporting gas. That's just the dynamics of the beast.

Senator WYDEN. I'm going to review this with you all in the days ahead. I mean, the State disagrees with you, obviously. Then of course, there was an application to export even more gas than had been previously licensed to import.

We'll continue this discussion. But obviously my State disagrees strongly with your views.

Thank you, Mr. Chairman.

The CHAIRMAN. Let me ask if either Senator Hoeven or Senator Barrasso had another question.

Thank you both very much for your testimony. We appreciate it. We will go ahead to the second panel at this point.

If the second panel of witnesses can come forward. I'll introduce them as they are coming forward. We have 3 witnesses on the second panel.

Dr. Ken Medlock, who is a Fellow in Energy Resource Economics and Deputy Director of the Energy Forum at Rice University in Houston.

We have Mr. Andrew Slaughter, who is a Business Environment Advisor with Upstream Americas, Shell Exploration Production Company in Houston.

Mr. Jim Collins, who is Director of Underground Utilities in the city of Hamilton, Ohio.

So we appreciate all of you being here. If you could each take about 5 minutes and summarize the main points you think we need to understand about this set of issues. Then we will have some questions.

Dr. Medlock.

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

Mr. MEDLOCK. Thank you. Thank you for the opportunity to be here today to talk about this issue. I actually found the initial panel very enlightening to hear about how operators within the Federal Government are actually thinking about these issues is always useful.

At its very face if you want to get really down at the very basic level to try to understand what exactly will determine domestic price verses foreign price. Fundamentally what you have to understand is what domestic supply actually looks like. So what I mean by that is really a reference to a term that economists use a lot when we think about the shape of a supply curve, if you will, which is elasticity.

In effect if you have a situation where domestic supply is highly elastic, so it's very price responsive. In other words, which means if we see a small increase in price we'll see a pretty dramatic increase in production. Then the introduction of exports from the U.S. market will not actually have, in a very fundamental way, a very large impact on domestic price.

On the other hand, if domestic supply is what we would term as inelastic so you have a very steep supply curve, in other words. Then you would actually see from the introduction of exports a pretty dramatic increase in price.

I know this is kind of a take you back to ECON 101 description of the issue. But I think if we're really going to address this issue and try to understand what exports could potentially mean. Sometimes it really does take, you have to take a step back and go back to fundamentals to really understand what we're talking about.

With regard to all of the proposed export terminals that are on the plate, you know, up to 6.6 billion cubic feet a day, have been filed for export license. That is actually quite a large number when we think about where we've been with regard to the North American market, particularly when we think about where we were just 10 years ago when we were thinking about importing LNG in massive quantities. At one point 10 years ago there were over 47 different terminals that had received certification for construction to import natural gas to this country.

So we have actually done quite a massive about face. So what we ultimately have to do is understand why that's happened and how transformative ultimately it really is. At the root of all this is what's been happening on the shale gas front. Just 10 years ago a lot of what we talk about today was not believed to be technically nor commercially feasible.

Yet today we sit here in a situation where it is. What that's done is effectively taken domestic supply and made it very elastic. It stretched our domestic supply curve.

That, to be very frank, is why we're actually having this conversation about exports to begin with because as you remember, as I just mentioned, 10 years ago everybody was talking about imports. We were talking about inexorable declines from the North American resource base. But that is completely different today.

So what we ultimately have to understand since we're really thinking about long term type of futures here, is what is the elasticity of supply. How abundant is the resource? At what cost can it be developed?

Those are actually pretty critical, fundamental, engineering and economic questions about which there is a lot of very good research being done. The work that we've actually done at the Baker Institute indicates that there are upwards of 350 to 400 trillion cubic feet of gas available at prices between $5 and $6 an MCF. That's actually a pretty large quantity that can be used to support export projects should they be deemed to be commercially viable which is another issue that I can address in Q and A.

But if there are better, sort of, those supplies are better served serving domestic demands then so be it. But that's something that actually commercial interests in the market will determine. It's something that the commercial interest in the market have deter-

mined actually quite well to wit what we've seen in shale gas production developments in the last 10 years.

One quick note about and I think it's actually worth me making this comment because the slide was actually put up by Senator Wyden. When we look at the drift between international natural gas prices and domestic natural gas prices there's a very key component here that I think often is omitted from the conversation. That's the role of the U.S. dollar.

Natural gas when we think about prices in Europe for example or prices in Asia for example in domestic markets there is not traded in dollars per M and BTU. It's traded in local currency units. So one other thing you have to actually do to look at the potential arbitrage opportunity that exports would portend would actually be to multiply by an exchange rate.

If you look at the direction the U.S. dollar is actually taking over the last several years, it has not been—it has been very positive for that arbitrage opportunity. So when you think about the potential for LNG exports that's actually a commercial risk when we think about the nominal value of that arbitrage that the developers have to consider.

[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, JAMES A BAKER III INSTITUTE FOR PUBLIC POLICY, RICE UNIVERSITY, HOUSTON, TX

During the past decade, innovative new techniques involving the use of horizontal drilling with hydraulic fracturing have resulted in the rapid growth in production of natural gas from shale. Although geologists have long known about the existence of shale formations, accessing those resources was long held to be an issue of technology and cost, and recent innovations have yielded substantial cost reductions and made shale gas production a commercial reality. In fact, shale gas production in the United States has increased from virtually nothing in 2000 to over 10 billion cubic feet per day (bcfd) in 2010, and a recent Baker Institute analysis indicates it could reach over 50 percent of domestic natural gas production by the 2030s.

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 a growing interest in shale resource potential in other parts of the world. Thus, North American shale gas developments are having effects far beyond the North American market, and these impacts are likely to expand over time. Prior to the innovations leading to the recent increases in shale gas production, huge declines were expected in domestic production in the United States and Canada, which comprise an integrated North American market. This foretold an increasing reliance on foreign supplies at a time when natural gas was becoming more important as a source of energy.

Throughout the 1990s, natural gas producers in the Middle East and Africa, anticipating rising demand for liquefied natural gas (LNG) from the United States in particular, began investing heavily in expanding LNG export capability, concomitant with investments in regasification being made in the United States. At one point in the early 2000s there were over 47 regasification terminals with certification for construction, which was a clear signal regarding industry-wide expectations for the future of the U.S. supply. But the rapid growth in shale gas production has since turned such expectations upside down and rendered many of those investments obsolete. Import terminals for LNG are now scarcely utilized, and the prospects that the United States will become highly dependent on LNG imports in the coming years have receded, with proposals now emerging for exports of LNG from North America.

Rising shale gas production in the United States is also impacting markets abroad. LNG supplies whose development was anchored to the belief that the United States would be a premium market are now being diverted to European and Asian buyers. This has presented consumers in Europe with an alternative to Russian pipeline supplies, and it is exerting pressure on the status quo of indexing gas

sales to a premium marker determined by the price of petroleum products. In fact, Russia has already had to accept lower prices for its natural gas and is now allowing a portion of its sales in Europe to be indexed to spot natural gas markets, or regional market hubs, rather than oil prices. This change in pricing terms signals a major paradigm shift in Europe, and could be the first signal for Asian buyers that oil-indexation may become a thing of the past. This is an important point when considering the current profit margin available to potential LNG exports, particularly when those export projects hinge on oil-indexed prices and a wide oil-gas price differential.

Certainly rising shale gas production has contributed to lower domestic natural gas prices. This, in turn, has led various interests to promote greater use of natural gas in power generation through substitution opportunities with coal, and renewal of industrial demands which had previously been fading. In addition, there has been interest in creating new demands, such as the use of natural gas in transportation particularly as the price of crude oil remains substantially higher than the price of natural gas on an energy equivalent basis. Finally, as noted above, 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.

On the point of LNG exports, there are several key factors that (a) determine whether or not they occur and (b) the impact, if exports do occur, on domestic prices. Critical factors addressed herein that determine the quantity of exports and the effect on domestic price are (i) the elasticity of domestic supply, (ii) the elasticity of foreign supply, (iii) the exchange rate, and (iv) the cost of exports. For the purpose of this discussion, we will assume the cost of exports is not prohibitive unless otherwise stated.

THE DOMESTIC SUPPLY PICTURE

With regard to point one above, a comparison of the two diagrams below* illustrates very simply the effect of the elasticity of domestic supply on the impact of increased exports on domestic price. In particular, if domestic supply is highly elastic as in the first diagram, meaning production can be profitably increased with only small changes in price, then exports, which are shown here as an increase in demand for domestic resources, will not raise price by much. This contrasts to the case in the second diagram where supply is not very elastic. In this case, the same export quantity will raise price by a substantial amount.

While this is an admittedly simple way to examine the posed problem, it can yield some powerful insights. We still need to understand the effects of the elasticity of foreign-sourced supply as well as the exchange rate, but these issues will largely determine the quantity of exports if allowed to increase unconstrained. However, we are still left with the task of understanding how elastic the domestic supply of natural gas is. To do so, we must first understand the magnitude of the technically recoverable domestic resource base, something which has changed rapidly over the last decade.

As recently as 2003, the National Petroleum Council[1] estimated about 38 trillion cubic feet (tcf) of technically recoverable resources were spread across multiple basins in the North America. In 2005, the Energy Information Administration (EIA) used a mean estimate of 140 tcf in its Annual Energy Outlook for technically recoverable shale gas resources. In 2008, Navigant Consulting, Inc.[2] estimated a mean of 280 tcf of technically recoverable resources from reviewable geologic literature, but a survey of producers indicated up to 840 tcf. In 2009, the Potential Gas Committee[3] put its mean estimate at just over 680 tcf. In 2011, Advanced Resources International reported an estimate of about 1,930 tcf of technically recoverable resource for North America, with over 860 tcf in U.S. gas shales alone.[4] Although the assessments listed above are from independent sources, the estimates are increasing over time, which is a pattern that is largely coincident with more drilling activity and technological advances, which is an indication of the learning-by-doing that is still occurring. While there remains disagreement about the exact size of the shale

* Graphs have been retained in committee files.

[1] NPC, Balancing Natural Gas Policy: Fueling the Demands of a Growing Economy, September 2003.

[2] Navigant Consulting, North American Natural Gas Supply Assessment, July 4, 2008.

[3] The Potential Gas Committee, Potential Gas Committee Biennial Assessment, June 18, 2009.

[4] World Gas Shale Resources: An Assessment of 14 Regions outside the United States, a report prepared by Advanced Resources International for the United States Energy Information Administration, April 2011.

resource base, the disagreement is about magnitudes which are all substantially larger than our state of knowledge even just six years ago.

The introduction of shale to the US supply portfolio has effectively stretched the domestic supply curve. Equally importantly, however, is the cost of recovery as cost determines how much of the resource is commercially recoverable at a particular price. To understand this, most analysts examine data involving the costs from acreage acquisition to well completion and the production profile and estimated recoverability of each well. This enables a cost ranking of wells and the construction of a distribution of "type" wells. Usually, these analyses indicate a great degree of heterogeneity among wells drilled in a single shale play, with some wells profitable at relatively low prices and others at much higher prices, meaning some wells drilled are indeed uneconomic. However, the producer's decision to develop is based on a portfolio of wells, and even uneconomic wells can inform future development decisions in that they reveal information about the acreage being developed. In fact, it is this latter point that can bear long term returns, as witnessed in the Barnett shale today.

The Barnett shale, the most mature of the shale plays and where the venture into shale began in earnest less about a decade ago, is a good barometer for the "learning-by-doing" that occurs as shale wells are drilled. In the Barnett to date, over 12,000 horizontal wells have been drilled. In the last 3 years, operator efficiency has dramatically improved, as witnessed by the fact that rig counts are down from 192 per week in September 2008 to 64 per week in September 2011, but production was higher. Much of this owes to operators finding the so-called "sweet spots" in the shale and understanding better an optimal drilling strategy. Moreover, there are ongoing innovations that will challenge our understanding of both cost and recoverability as drilling is being reduced from 80 acre spacing to 40 acres, with some operators now testing 20 acre spacing. In all, as operators develop shale they learn about the resource and apply those lessons to reduce costs. In the upstream in general, this is nothing new, and it tends to make supply more elastic.

Bringing it all together, many estimates indicate there is a very large quantity of shale resource that is economically recoverable at between five and six dollars per thousand cubic feet. The Baker Institute, for example, estimates that up to 350 trillion cubic feet of shale gas is commercially viable in North America at prices up to six dollars. So, using this as a benchmark, we can say that the domestic supply curve has effectively been stretched horizontally with the commercialization of shale. In other words, it is as if we have moved from a world that more closely resembled the supply curve in the second diagram above, to one which more closely resembles the supply curve in the first diagram, i.e.—shale has rendered domestic supply to be much more elastic.

An important factor that could limit the amount of shale gas that could be developed at particular prices pertains to regulation. Specifically, regulations that inhibit development will effectively render domestic supply to be more inelastic. Thus, if concerns exist that exports will raise price domestically, then it is important to juxtapose any potential set of regulations that could limit domestic production in certain regions against the regulatory approval of export projects.

In relation to European and Asian markets, the United States has a well-developed, competitive regulatory framework governing natural gas infrastructure development, transportation services, marketing, and mineral rights ownership and acreage acquisition. This regulatory environment has promoted the rapid development of shale resources, and it may not be fully or quickly replicable in other markets around the globe where state involvement in resource development and transportation is more prevalent. For example, investor access to shale resources is likely to be more heavily controlled in most Asian and European countries, where land ownership is generally distinct from the ownership of mineral rights. This will in general render US supply to be more elastic, particularly in the context of shale gas, than foreign supply. However, it is difficult to argue that foreign supply is inelastic when one considers the vast quantities of resources available in Russia, Australia, the Middle East and North Africa. Thus, we are left with a situation in which both domestic and international supplies are relatively elastic, albeit they are so at different marginal costs.

International Factors

Perhaps the most voiced concern regarding export of LNG from the US is one which posits the domestic natural gas price will rise to international parity. To understand whether or not this will indeed occur, one must first understand under what circumstances it could occur. First, it must be true that export capacity be sufficient to fully arbitrage the difference between domestic and international gas prices. In other words, there can be no constraint on export capacity. If export ca-

pacity is constrained, then, all else unchanged, the international price will remain substantially above the domestic price, but of course, this would provide incentive for investments in export capacity.

Second, if we pose no constraints on export capacity, the change in the domestic price will depend on the shape of the international supply curve, as well as the exchange rate, assuming of course that cost is not an impediment. In general, if foreign supply is inelastic, then the price in the foreign market should be lowered as foreign suppliers are driven out of the market by lower cost supplies from US exporters. If domestic supply is very elastic, then the domestic price will not change much, but the foreign price would. In fact, if this were the case, the long run price in overseas markets would simply be the domestic price plus the cost of exports. In other words, most of the price action would occur in overseas markets.

If, however, domestic supply is relatively inelastic, then price would be driven up domestically at the same time price is driven down in the foreign market. But, this dynamic would limit the quantity of exports as profitability would quickly become challenged. In either case involving inelastic foreign supply, the domestic price will not simply increase to the current foreign price. Instead, it will rise to something below it, but the degree to which domestic price increases will depend on domestic supply elasticity.

Assuming domestic exports are profitable, if foreign supply is very elastic, then exports would increase until either almost all foreign supply is displaced (if domestic supply is very elastic) or until the domestic price is driven up to the point where exports are no longer profitable (if domestic supply is very inelastic). Again, the domestic price impact is largely determined by domestic supply elasticity, but now the price impact could be one in which the domestic price rises while the foreign price is relatively unchanged. This would only occur, however if domestic supply is inelastic and foreign supply is elastic.

Another point worth noting, as done is a recent Baker Institute working paper, is the effect that the exchange rate has on the commercial feasibility of exports. In the US, natural gas is traded in dollars per million British thermal units ($/mmbtu). In the UK, for example, natural gas is traded in pence per therm (p/therm). In order to assess the arbitrage opportunity that exists through exporting natural gas from the US to the UK, we must multiply the UK price by a heating conversion, which is constant, and the exchange rate. Thus, if the US dollar is relatively weak, then the arbitrage opportunity expands. However, this type of opportunity arises due to nominal exchange rate movements, and investments made on this basis will be subject to substantial risk based solely on exchange rate movements.

To put the exchange rate risk into the context discussed above, one only need understand that movements in the exchange rate would effectively shift the foreign supply curve (when denominated in $/mmbtu) up and down, so long as we are measuring things in nominal terms. Hence, a stronger dollar would effectively lower the foreign supply curve and limit the commercial feasibility of exports. Thus, any investment in export capacity made today that does not account for this could run a serious risk of being "upside down" in the future.

Concluding Remarks

To summarize, the effect of US LNG exports on the price of natural gas in the US depends on a number of factors. In general, LNG exports, if allowed to increase to the point where all arbitrage opportunities are allowed, would both increase the domestic price and decrease the foreign price. However, the degree to which each price moves will depend on the relative elasticity of supply in each market. Research done at the Baker Institute indicates that the long run elasticity of supply is relatively high both domestically and internationally. This means that capacity constraints on the ability to trade between markets heavily influence regional price differences. Furthermore, such constraints represent real opportunities that may signal real investment opportunities in developing export capacity.

Highly elastic supply curves both domestically and internationally suggest that prices in the US if exports are allowed will not likely increase much, particularly not given the combined capacity of the current slate of LNG export projects. Nevertheless, an assumption that all exports will be valued at an oil-indexed premium in all future years may be a strong one. By adding low cost supply to a market, the effective supply curve becomes more elastic, which will tend to reduce the ability for producers to price their supplies above marginal cost.

Finally, movements in the exchange rate contribute to nominal price differences, although these differences should not generally signal investment opportunities. Specifically, exchange rate motivated arbitrage opportunities are likely to be transitory.

The CHAIRMAN. Thank you very much.
Mr. Slaughter.

STATEMENT OF ANDREW SLAUGHTER, SHELL EXPLORATION & PRODUCTION COMPANY, HOUSTON, TX

Mr. SLAUGHTER. Chairman Bingaman, Ranking Member Murkowski, distinguished committee members, thank you for providing me this opportunity to discuss our Nation's new found natural gas abundance and the emerging market developments it's driving.

Above all these resources can and must be developed in environmentally responsible and sustainable ways. Risks must be managed and mitigated. Best available technologies and operating practices must be employed. Operators should set and meet high standards and support a regulatory regime that does the same.

Shell's operating principles for onshore upstream operations in North America set high standards for preventing and mitigating risks and impacts. This is part of our commitment to safety and environmental stewardship. It's the foundation of our investment program.

We're looking at very important investments because we know that America now has enough natural gas to power the country stably and affordably for well over a century even taking into account sustained demand growth. This is good news for consumers in all sectors and for U.S. industrial competitiveness. Indeed these trends offer potential for a rebirth in the American manufacturing sector.

Expand in natural gas supply has several important implications for new and existing gas markets in the U.S.

First, it is clear that affordable, domestic natural gas supplies will provide reliable fuel at stable prices for U.S. power generation, other industrial sectors and households for decades to come. This is an economic benefit to utilities and consumers but also offers significant environmental benefits thanks to lower levels of pollutants, waste and CO_2 associated with natural gas relative to other fossil fuel sources. That's not all.

Natural gas abundance is also driving emerging new economic sectors with great potential for the U.S. Shell is considering significant new investments in these areas all founded in our deep confidence in the robust and affordable U.S. natural gas supply outlook. Here are some examples.

In the gas to chemicals area in the Northeast Shell recently announced we are evaluating construction of a new world class facility to manufacture base chemicals in the Marcellus shale region. This will be the first of its kind in several decades. Seven other companies have also indicated that they might construct similar facilities in the U.S.

Rising gas supplies are giving the U.S. chemical industry a new lease on life and creating thousands of jobs in the process. A recent study by the American Chemistry Council noted potential for 17,000 new, knowledge intensive, high paying jobs in the U.S. chemical industry, another 400,000 jobs outside the chemical industry and more than $130 billion in new U.S. economic output. All associated with the shale gas revolution.

We're also expanding into new markets for which we've developed innovative technologies. Potential new lines of investment include LNG for transport. Recently Shell announced a plan to make LNG available as a fuel for heavy duty fleet trucks beginning in 2012 in Western Canada. By making LNG available on the areas heaviest truck route, we are creating an infrastructure opportunity for the market to choose LNG as a sustainable transport fuel.

Gas to liquids. This technology converts domestically produced natural gas into liquid fuels such as ultra pure, clean burning diesel and aviation fuel instead of importing it or refining imported crude. Shell pioneered this technology and recently brought online a world class GTL facility in Qatar.

LNG for exports. Managed properly LNG exports can spur greater investment in U.S. supply and infrastructure, create domestic jobs and position this country as an energy exporter. The abundance of supply means that exports can be pursued in addition to the expansion of the domestic markets adding balance of trade benefits to domestic economic benefits.

Developing markets for natural gas is a clear long term, sustainable win for the U.S. Shell is making significant investments in these areas because we are confident in natural gas's potential to be the most promising energy opportunity in the U.S. for decades to come. We are ready to work with fellow operators, regulators and yourselves to safely and responsibly realize multiple opportunities and benefits made possible by this huge, abundant, new domestic gas resource.

Thank you. I'm ready to answer questions on any of these topics.

[The prepared statement of Mr. Slaughter follows:]

PREPARED STATEMENT OF ANDREW SLAUGHTER, SHELL EXPLORATION & PRODUCTION COMPANY, HOUSTON, TX

Chairman Bingaman, Ranking Member Murkowski, distinguished committee members; thank you for providing me this opportunity to discuss our nation's newfound natural gas abundance and the emerging market developments it is driving.

Above all, these resources can and must be developed in environmentally responsible and sustainable ways. Risks must be managed and mitigated. Best available technologies and operating practices must be employed. Operators should set, and meet, high standards, and support a regulatory regime that does the same.

Shell's operating principles for onshore upstream operations in North America set high standards for preventing and mitigating risks and their impacts. This is part of our commitment to safety and environmental stewardship, and the foundation of our investments.

And they are important investments. Because we know that America has enough natural gas to power the country stably and affordably for well over a century, even taking into account sustained demand growth.[1] This is good news for consumers in all sectors and for US industrial competitiveness—indeed these trends offer potential for no less than a rebirth of the American manufacturing sector.

Expanded natural gas supply has several implications for new and existing gas markets in the U.S.

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[1] Although estimates of the remaining US technically recoverably natural gas resource base vary widely, all experts concur that the US endowment of natural gas is vastly greater than they had previously understood it to be. Between 2008 and 2010, Colorado School of Mines' Potential Gas Committee revised their estimates of the US Future Gas Supply upward by 89%. (See: http://www.potentialgas.org/) The US Geological Survey conducted focused research on the Marcellus Shale region in 2002 and again in 2011. In 2002, the USGS's mean estimate of the technically recoverable natural gas in the Marcellus Shale was roughly 2 trillion cubic feet. In 2011, they estimated that the Marcellus Shale holds 84 trillion cubic feet—a 4100% increase from their 2002 estimate. (See: http://www.usgs.gov/newsroom/article.asp?ID=2893)

First, it is clear that affordable, domestic natural gas supplies will provide reliable fuel at stable prices for U.S. power generation and other existing industrial demand sectors for many decades. This is an economic benefit for utilities and consumers, but it also offers significant environmental benefits thanks to the lower levels of pollutants, wastes and CO2 associated with natural gas as measured against other fossil fuel sources.

But that's not all. Natural gas abundance is also driving emerging new economic sectors with great potential for the U.S. Shell alone is considering several significant investments—all founded on our confidence in the robust and affordable U.S. natural gas supply outlook.

Some examples:

- Gas to Chemicals: In the Northeast, Shell recently announced that we are evaluating construction of a world-class facility that will manufacture base chemicals in the Marcellus shale region—the first of its kind in decades. Seven other companies have also indicated that they may also construct similar facilities in the U.S.

Rising gas supplies are giving the U.S. chemical industry a new lease on life and creating thousands of jobs in the process. A recent study by the American Chemistry Council noted the potential for 17,000 new knowledge-intensive, high-paying jobs in the U.S. chemical industry, another 400,000 jobs outside the chemical industry and more than $132 billion in U.S. economic output—all associated with the shale gas revolution.[2]

We're also expanding into markets that were unthinkable a few years ago in the United States. Potential new lines of investment include:

- Liquefied Natural Gas (LNG) for use as a transport fuel: Recently, Shell announced a plan to make LNG available for heavy-duty fleet and trucking companies to use as a transportation fuel beginning in 2012 in Western Canada. By making LNG available on the area's heaviest truck route, we are creating an infrastructure opportunity for the market to choose LNG as a sustainable transportation fuel.[3]
- Gas to Liquids (GTL): This technology converts domestically produced natural gas into liquid fuels, such as ultra-pure, clean burning diesel and aviation fuel, instead of importing it or refining imported crude. Shell pioneered this technology and recently brought a world class GTL facility online in Qatar.
- LNG for export: Managed properly, LNG export could spur greater investment in U.S. supply and infrastructure; create domestic jobs and position our country as an energy exporter. The abundance of supply means that exports can be pursued in addition to expanding domestic uses of natural gas—adding balance of trade benefits to domestic economic benefits with little impact on gas prices.

Developing markets for natural gas is a clear long-term, sustainable win for the U.S. Shell is making significant investments in this area because we believe in natural gas' potential to be the most promising energy opportunity for decades to come. But to realize its full potential, we must bolster public confidence in tight gas as a safe and sustainable energy resource.

We stand ready to work with our fellow operators, regulators and yourselves, to safely and responsibly realize the manifold opportunities and benefits made possible by this domestic gas bounty.

Thank you.

The CHAIRMAN. Mr. Collins, go right ahead.

STATEMENT OF JIM COLLINS, DIRECTOR OF UNDERGROUND UTILITIES, HAMILTON, OH

Mr. COLLINS. Chairman Bingaman, Ranking Member Murkowski and members of the committee, I appreciate this opportunity to testify before you today and thank the committee for calling this important hearing on market developments for United States natural gas and the approval process and potential for liquefied natural gas exports.

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[2] See study conclusions here: http://www.americanchemistry.com/ACC-Shale-Report

[3] According to a study by Resources for the Future, LNG trucks may be the most cost-effective way of both reducing oil consumption and CO_2 emissions. http://www.rff.org/RFF/Documents/RFF-BCK-Krupnick-NaturalGasTrucks.pdf

My name is Jim Collins and I am the Director of Underground Utilities for the city of Hamilton, Ohio. Since 1890 the city of Hamilton has provided customer owned utility service to its residents. Hamilton is the largest municipal gas utility in the State of Ohio and currently serves approximately 23,000 customers.

There are approximately 1,000 public gas systems located in 36 States. Publicly owned gas systems are not for profit, real distribution entities owned by and accountable to the citizens they serve. Over the past several years technological advances in natural gas drilling techniques have made access to the vast domestic shale reserves possible. Assuming that the environmental concerns associated with these new drilling technologies are overcome, which seems likely, the energy landscape of the United States will have been unquestionably and forever altered.

The U.S. now has a unique window of opportunity to implement its long declared but never seriously pursued policy of energy independence and thereby fundamentally transformed key variables affecting both our national security and domestic economy. Pursuit of energy independence requires the United States to wean ourselves of its imported oil which accounts for approximately 50 percent of domestic use.

Two major consumers of foreign oil in the United States are the transportation sector and the industrial sector. By converting commercial vehicles to natural gas and recognizing the significant increase in natural gas for electric generation where that makes sense. For example, to firm up power for intermediate resources the United States can take giant steps toward energy independence and reducing greenhouse gas emissions. To accomplish this goal natural gas in the United States must remain plentiful and reasonably priced.

Several applications have been filed at the DOE for the export of LNG. Just the volumes enumerated in these few applications would make the United States the second largest exporter of LNG in the world. If granted by the DOE would permit just the export of just under 3 trillion cubic feet of natural gas which represents over 10 percent of our consumption on an annual basis.

This potential level of export could have seriously adverse implications not only for U.S. national security, but for domestic consumers of natural gas. U.S. natural gas prices today are affordable, competitive and stable in contrast to the situation just a few years ago. This important change in gas pricing is a product of both the new available supplies of natural gas and the fact that our natural gas market is largely limited to North America.

At these prices natural gas vehicles are priced competitive with gasoline. By contrast the large scale export of natural gas via LNG would not only play havoc with the current supply/demand situation and hence the price of natural gas but will also because the price of natural gas abroad is tied to the international oil market, inevitably link the price of domestic gas to these international oil markets which are substantially more volatile and less transparent than our domestic market.

In addition, since commodities such as natural gas are sold where the price is the highest irrespective of national boundaries and since many foreign Nations have substantially higher price for

natural gas, U.S. natural gas would likely fall abroad in times of shortage further increasing prices for domestic consumers and further undermining efforts to maintain domestic gas prices at competitive levels.

APGA is not against free trade. But when important policies collide Nations must make choice. U.S. policymakers must carefully consider and prioritize the use of domestic resources according to the national interest over both the long and short terms.

APGA submits that the decision to export LNG should be thoroughly vetted in the context of a national energy policy. The wise choice of our elected officials at this time in our history is to limit the export of natural gas so they may realistically pursue the goal of greater energy independence. Those who argue that this matter is not an either/or situation are wagering our long term national well being on short term profits.

We urge the committee to carefully consider the adverse impact that exporting LNG will have on millions of homes and the natural gas consumers in the United States, who feel the impact of higher prices resulting from exposure to the global export market.

We thank you for the opportunity to submit testimony and look forward to working with the Commission on this important issue.

[The prepared statement of Mr. Collins follows:]

PREPARED STATEMENT OF JIM COLLINS, DIRECTOR OF UNDERGROUND UTILITIES, HAMILTON, OH

Chairman Bingaman, Ranking Member Murkowski and Members of the Committee, I appreciate this opportunity to testify before you today and I thank the Committee for calling this important hearing on market developments for U.S. natural gas and the approval process and potential for liquefied natural gas (LNG) exports. My name is Jim Collins and I am the Director of Underground Utilities for the City of Hamilton, OH. Since 1890, the City of Hamilton has provided customer-owned utility service to its residents. Hamilton is the largest natural gas municipal utility in the State of Ohio and currently serves approximately 23,000 customers.

I testify today on behalf of the American Public Gas Association (APGA). APGA is the national association for publicly-owned natural gas distribution systems. There are currently 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. Public gas systems range in size from the Philadelphia Gas Works, which serves approximately 500,000 customers, to the City of Freedom, Oklahoma, which serves some 12 customers.

As non-profit utilities, public gas systems' primary focus is on providing reliable and affordable service to their customers. As a trade association that represents public gas systems, APGA ultimately represents the interests of natural gas consumers. Our members have a vested interest in working towards long-term affordable energy prices and allowing their citizens to keep their dollars in the community as opposed to flowing upstream via high energy prices.

OVERVIEW OF POLICY IMPLICATIONS OF LNG EXPORT ISSUE

This Nation is at an energy policy crossroads. Today, for the first time in a very long time, gas prices are affordable and stable, as contrasted with the price volatility experienced for most of the past 20 years during which time prices for natural gas bobbed up and down from $15 to $5 to $10, with little rhyme or reason in terms of market fundamentals. Our Nation now has a unique opportunity to pursue a longstanding goal—energy independence—with optimism. Today, for the first time in almost forever, this Nation has the opportunity to be able to foresee the day when it can conduct foreign policy without being preoccupied by Middle East oil and hence Middle East politics.

Why is our Nation in this most fortuitous situation and what can we do to realize these obtainable goals?

The key reason we are in this posture is that suddenly, due to advances in technology relating to the acquisition of gas reserves from shale rock, it appears reasonable to prognosticate that the United States will not have to look abroad for natural gas supplies to supplement waning gas reserves in this country. This has obvious ramifications for natural gas policy; but even more importantly, it has huge potential ramifications for national energy policy (and therefore our national security).

Pursuing energy independence means dramatically reducing our reliance on foreign oil. The major reason accounting for oil imports into the United States is our use of oil and its derivatives in all forms of transportation—cars, trucks, busses, planes, and the like. By converting our transportation sector to reliance on alternative energy sources—including Compressed Natural Gas (CNG), electricity, hybrid vehicles using CNG or LNG, and the like—we can reduce oil imports dramatically to the point where foreign oil no longer dictates events in this country—be it foreign policy or consumer grousing about skyrocketing prices at the gas pump.

What other benefits will this Nation reap from substituting natural gas for oil products? The answer, of course, is greatly reduced CO2 emissions. Natural gas is a fossil fuel and not to be confused with renewable energy sources, but it is so far superior to oil in terms of its impact on the environment that its greater use in lieu of oil is unquestionably in the public interest. In addition, natural gas in fast-ramping power plants is essential for reliable power supply in connection with renewable resources such as wind and sun due to their intermittent nature.

What is the single greatest threat to the scenario just described? Assuming that the shale gas revolution is real, a subject we will address in our comments below, and assuming that substantial amounts of natural gas can be extracted from shale rock deep in the earth in an environmentally acceptable fashion, which seems a reasonable assumption based on experience to date, the only road block to success is that the natural gas that we should be using domestically for transportation, for power plants, not to mention enhanced residential and commercial use, is exported abroad and that we become part of a global and unstable natural gas market, just as we have with oil. What seems clear beyond cavil is that if we export significant quantities of natural gas (in the form of LNG), we will become part of an international market in order for short-term profits to be made by the affected producers and exporters. But long-term the effects will be predictable and disastrous—we will experience price increases and the price volatility of the past will return, and our opportunity to displace foreign oil will be wasted—all for short-term profits of a few. You must not permit that result; but without action by Congress that is the inevitable result of current Department of Energy (DOE) policy on LNG exports.

NATURAL GAS SUPPLY

Over the past several years, technological advances in natural gas drilling techniques have made access to vast domestic natural gas reserves possible. The U.S. Energy Information Administration (EIA) 2011 Annual Energy Outlook reports that in 2010, U.S. shale gas production reached 4.87 trillion cubic feet (TCF) which equates to 23 percent of total U.S. natural gas production, compared with 0.39 TCF in 2000. This shows both the rapid growth and absolute importance of the shale gas resource to the United States. The energy landscape of the U.S. appears to have been unquestionably and forever altered.

APGA certainly hopes that the prospects for shale gas in this country are as bright as have been painted. However, as stated by EIA, there remains "considerable uncertainty about the ultimate size of the technically and economically recoverable shale gas resource base in the onshore lower 48 States and about the amount of gas that can be recovered per well, on average, over the full extent of a shale gas formation."[1] EIA notes that some of the uncertainties associated with shale gas formations include the fact that "most shale gas wells are only a few years old, and their long-term productivity is untested" and that "[i]n emerging shale formations, gas production has been confined largely to 'sweet spots' that have the highest known production rates for the formation," which means that "[w]hen the production rates for the sweet spot are used to infer the productive potential of an entire formation, its resource potential may be overestimated."[2] Articles appearing in the national press indicate that there may be other troubling concerns at EIA about the shale gas phenomenon that are not being advertised in EIA's formal publications.[3]

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[1] EIA, Annual Energy Outlook 2011

[2] Id.; see also, Rodney White, Professor: NY Shale Reserves May Disappoint, Gas Daily (July 7, 2011) (reporting that Marcellus Shale gas reserves in New York may not be nearly as lucrative as already developed locations in Pennsylvania).

[3] Ian Urbina, "Behind Veneer, Doubt on Future of Natural Gas," N.Y. Times, June 26, 2011; http://www.nytimes.com/2011/06/27/us/27gas.html?_r=2&hp

In addition to the technical issues noted by EIA, there are serious environmental concerns being raised at the state and national level about the technology associated with hydraulic fracturing, now commonly known as "fracking." While these concerns do not affect EIA's projections, which are based on technical and economic data, they should not be ignored by those making policy decisions on applications that depend entirely for their viability on ample future natural gas from shale formations. While it is true that there has been much extreme rhetoric on both sides of the "fracking" issue,[4] there can be no doubt that the affected states and the Federal Government are taking the health-related issues seriously.[5] The outcomes of those investigations are not now known, and will not be for some period of time. Thus, to draw any policy conclusions based on the "shale gas revolution," as some call it, would be a mistake of immense proportions—especially when those decisions have the very real potential to affect our national security.

The history of the fossil fuels industry is replete with miscalculations regarding supplies. For example, not too long ago many of the corporate parents of those now pursuing LNG export predicted that the U.S. natural gas market would benefit significantly from the import of LNG.[6] Billions of dollars were spent on projects that are now charitably referred to as white elephants.

In addition, the nation's first LNG export facility in Kenai, Alaska is slated to terminate exports sooner than expected because drilling activity in Alaska's Cook Inlet has not offset declines in production rates, making it unfeasible to continue LNG exports.[7]

If the U.S. has less recoverable gas than projected, it certainly should not exacerbate the situation by approving export applications premised on a domestic oversupply. Additionally, lower than projected amounts of recoverable gas would worsen exponentially the risks inherent in tying U.S. natural gas prices to volatile international markets.

LNG EXPORT

To date, five applications for the export of LNG have been filed DOE. Applications have been filed by Sabine Pass and Lake Charles Exports in Louisiana and by Freeport LNG in Texas. More recently, we have seen an application filed for Dominion in Cove Point, MD. A fifth, Jordan Cove Energy Project, Oregon has yet to be published in the Federal Register. Some of these applications have already been granted and many more are expected to be filed.

Just the volumes enumerated in these few applications would make the United States the second largest exporter of LNG in the world. These five applications, if granted by DOE, would permit the export of just under 3 TCF of natural gas, which represents over 10% of our consumption on an annual basis. This level of export would have serious adverse implications not only for domestic consumers of natural gas but also for U.S. national security.

When applications are filed at DOE, there is a public interest test that must be met—but not by the applicants. In cases where the application is specific to identified countries with which the U.S. has a free trade agreement, the application is deemed to be consistent with the public interest and granted without modification

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[4] The newspapers are replete with articles chronicling the uncertain future of shale gas exploration. See, e.g., Ian Urbina, Regulation Lax as Gas Wells' Tainted Water Hits Rivers, N.Y. Times Online (Feb. 26, 2011); Ian Urbina, Wastewater Recycling No Cure-All in Gas Process, N.Y. Times Online (March 2, 2011); Ian Urbina, Pressure Limits Efforts to Police Drilling for Gas, N.Y. Times Online (March 4, 2011); Darryl Fears, Sitting Atop Huge Gas Reserve, Md. Debates Drilling Practice, Washington Post Online (March 28, 2011); Ian Urbina, Insiders Sound an Alarm Amid a Natural Gas Rush, N.Y. Times (June 25, 2011). Contrary views also abound: e.g., http://johnhanger.blogspot.com/2011/06/statement-about-todays-nyt-front-page.html

[5] In its Fiscal Year 2010 Appropriation Conference Committee Directive to EPA, the U.S. House of Representatives ordered the EPA to conduct a study of hydraulic fracturing. That study is currently underway. Seehttp://water.epa.gov/type/groundwater/uic/class2/hydraulicfracturing/index.cfmhttp://water.epa.gov/type/gro undwater/uic/class2/hydraulicfracturing/index.cfm.; On May 5, 2011, U.S. Secretary of Energy Stephen Chu impaneled a group of environmental, industry, and state regulatory experts to study and make recommendations to "improve the safety and environmental performance of natural gas hydraulic fracturing from shale formations." See http://www.energy.gov/news/10309.htm. Platt's Gas Daily for July 14, 2011, contains an article entitled "DOE Panel Questions Fracking's SDWA Exemption."

[6] See, e.g., BG LNG Services, LLC, Application of BG LNG Services, LLC for Long-Term Authorization to Import Liquefied Natural Gas from the Federal Republic of Nigeria, Docket No. FE 03-76-LNG (November 3, 2003) (application for import authority through the Lake Charles LNG terminal related to 20-year LNG purchase agreement).

[7] Isabel Ordonez, Conoco to Stop LNG Exports from Kenai Plant in Alaska, Wall Street Journal Online (Feb. 10, 2011).

or delay. In cases where an application is seeking exportation of LNG to countries with which the U.S. does not have free trade agreements, the burden is on those opposed to the application to demonstrate that the application is not consistent with the public interest. The structure of this process under which opponents of an export must prove a negative is counter-intuitive on its face and makes it extremely difficult, if not impossible, for opponents to defeat an application for the export of LNG. APGA supports the passage of legislation that places the burden of proof where it should be, on the applicant to demonstrate to DOE how the approval of that application is in the public interest.

It is also important to note that shale gas formations are not unique to the United States—this is not a U.S. phenomenon; it is a world-wide phenomenon.[8] The State Department launched the Global Shale Gas Initiative ("GSGI") in April 2010 in order to help countries identify and develop their unconventional natural gas resources.[9] To date, partnerships under GSGI have been announced with China, Jordan, India, and Poland.[10] The big energy players, including ExxonMobil, Chevron, Shell, BP, etc. are spending billions world-wide to pursue shale gas plays.[11] The point to be made, of course, is that the United States, which is at the forefront technologically of the development of shale gas reserves, should be exporting its technology and expertise—not spending billions of dollars to build facilities in order to export a commodity that can play such a vital role in contributing to our national well-being and that also may be abundant world-wide before the LNG export facilities can even be completed.

IMPACT ON CONSUMERS

U.S. natural gas prices are now among the lowest in the developed world. The large-scale export of natural gas via LNG will play havoc with the current supply/demand situation and hence the price of natural gas. Even supporters of LNG exports acknowledge that such exports will increase prices and price volatility in the domestic natural gas market.[12]

Exporting domestically produced LNG will tie U.S. natural gas prices to international markets that, today, yesterday and likely for the foreseeable future, will demand higher prices and undermine current domestic natural gas price stability. In Europe and Asia, natural gas markets are less liquid and prices are higher and often indexed to international oil markets, which are substantially more volatile and less transparent than our domestic market. Exporting domestically produced natural gas from the United States in any real quantities will link domestic commodity prices to international fluctuations.

The current domestic natural gas market is competitive, liquid and transparent while simultaneously, since it is a North American market, less susceptible to un-

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[8] E.g., "Shale Gas: Global Game Changer," by Dallas Parker, Oil and Gas Financial Journal (Feb. 8, 2011), http://www.ogfj.com/index/article-tools-template/ printArticle/articles/oil-gas-financial-journal/unconventional/shale-gas global.html; "Worldwide Gas Shales and Unconventional Gas: A Status Report," Vello A. Kuuskra and Scott A. Stevens ("'The final segment of this "paradigm shift"—the worldwide pursuit of gas shales and unconventional gas—has only just begun, with Australia, China and Europe in the lead. Europe's gas shale geology is challenging, but its resource endowment and potential are large.") http://www.rpsea.org/attachments/articles/239/KuuskraaHandoutPaperExpandedPresentWorldwideGasShalesPresentation.pdf. Debajyoti Chakraborty, Asia's First Shale Gas Pool Found Near Durgapur, Times of India Online, (January 26, 2011); Hillary Heuler, Shale Gas in Poland Sparks Hope of Wealth, Energy Security, Voice of America Online (June 11, 2011) (Reporting on efforts by U.S. and other western gas companies to develop gas from shale deposits). "The Shale Gas Run Spreads Worldwide," by Mark Summor IPS, Deccan Herald (Aug. 1, 2011)("Recent discoveries of deeply buried oil shale layers containing natural gas or oil are being reported in Australia, Canada, Venezuela, Russia, Ukraine, Poland, France, India, China, North Africa and the Middle East. Taken together, say some energy analysts, these 'plays' could become a game-changer, making Australia and Canada into new Saudi Arabias.").

[9] See http://www.state.gov/s/ciea/gsgi/

[10] Id. see also, Rakteem Katakey, India Signs Accord with US to Assess Shale-Gas Reserves, Bloomberg News (November 8, 2010) (The US signed a memorandum of understanding with India to help it asses its shale gas reserves and prepare for its first shale gas auction at the end of this year.); Kate Andersen Brower and Catherine Dodge, Obama Says US, Poland Will Cooperate on Economy, Energy, Bloomberg News (May 28, 2011) (Reporting on President Obama's pledge to share U.S. shale gas extraction expertise and technology on a recent trip to Warsaw); see also, Energy in Poland: Fracking Heaven, The Economist (June 23, 2011).

[11] "Big Oil Betting on Shale Gas," by Ken Silverstein, EnergyBiz (July 31, 2011)

[12] See, e.g., The BWMQ Energy Advisory, Volume 7, Issue 1 dated October 2011 (at page 4): "As we return to the world market, consumers will have to pay the higher world price because that is the minimum price that U.S. producers can get by offering their entire supply to the world market. The higher price will also increase price volatility. More exports will result in a tightening of domestic natural gas supplies in the future."

stable regimes, rapacious cartels, and distant events than foreign natural gas markets, which are tied to the global energy market.[13] At present, the U.S. natural gas market benefits from the security and political stability in North America. United States policymakers should act to preserve rather than undermine the stability of domestic commodity markets

In addition to tying U.S. natural gas prices to international volatility, LNG exports would inflate demand and prices by forcing U.S. consumers to compete with end-users in other nations that are required to pay more for natural gas. This would incontrovertibly increase the price for natural gas in the domestic market, especially in times of supply shortfall and further undermine efforts to maintain domestic gas prices at competitive levels.

JOB CREATION

Because of the high unemployment rate in this country today, some LNG export advocates argue that their projects are in the public interest because they will create jobs. However, what we should be looking for is real, durable job growth in the transportation sector due to infrastructure construction and related activities, rather than ephemeral job growth in a sector (LNG exports) that will likely disappear overnight when foreign countries begin to exploit their own shale gas reserves, making our LNG export facilities as useless as our LNG import facilities.

APGA respectfully submits that any national plan for durable job growth prioritize investment in domestic use of natural gas in the U.S. transportation fleet and in electric power generation. The U.S. transportation fleet is almost wholly dependent upon petroleum, which imperils our energy and national security. APGA submits that domestic investment in transforming our transportation fleet to Compressed Natural Gas (CNG) vehicles will provide significant job creation while also improving our national security.

Congress needs to look no further than legislation that has already been introduced in the House of Representatives to see the job creation potential of CNG vehicles: the New Alternative to Give Americans Solutions Act (NAT GAS Act), H.R. 1380. This bipartisan proposal introduced by Representatives Sullivan (R-OK), Boren (D-OK), Larson (D-CT), and Brady (R-TX) targets the replacement of the heavy-duty vehicle fleet by offering tax credits (for five years) for alternative fuel infrastructure installation, alternative fuel vehicle purchases, and alternative fuel credits, as well as other incentives. According to the bill's sponsors, this legislation has the potential to create 500,000 new jobs over the life of the legislation. It is important to note that this legislation targets only one subsector of one application of natural gas in the United States. The fact that this legislation could create half a million jobs in just one subsector, is indicative of the broad job creation potential of all applications of natural gas from vehicles to generation.

ENERGY SECURITY

A government that has the pursuit of energy independence as its declared national policy should not authorize exportation of a valuable commodity whose value at home is incalculable and whose supply is unknown with any degree of certainty at this point in time. Policymakers should seize this window of opportunity to implement our long-declared (but never seriously pursued) policy of striving towards energy independence. The pursuit of energy independence requires that the United States wean itself off of imported oil, which accounts for approximately 50% of our domestic use.

The two major consumers of foreign oil in the United States are the transportation sector and the industrial sector. Instead of exporting domestic natural gas, the United States should maximize its use domestically in order to displace the current reliance on imported petroleum products and on carbon-intensive coal. For instance, as the Secretary of Energy has made crystal clear, domestic natural gas should play a much larger role as a transportation fuel.[14] Currently, the U.S. im-

[13] See IFandP Newsroom, Commodities: Oil Price Volatility Up On Libya Rumours, US Natural Gas Continues its Slide, Industrial Fuels and Power Online (March 3, 2011) (reporting on rising prices and volatility in the international market for crude oil and unperturbed, declining prices for domestic natural gas).

[14] "The most direct way to reduce our dependency on foreign oil is to simply use less of it, starting with the cars and trucks we drive. Nearly 70 percent of our oil use is for transportation, and more than 65 percent of that amount is for personal vehicles... energy independence means changing how we power our cars and trucks from foreign oil to new American-made fuels and batteries." Nobel Physicist Steven Chu, U.S. Secretary of Energy, Pulling the Plug on Oil, Newsweek, April 4, 2009.

ports billions of dollars worth of oil from around the globe, a great deal of which is used for gasoline to fuel vehicles. The replacement of current gasoline-powered fleets with natural gas vehicles (and support infrastructure) would significantly reduce U.S. dependence on foreign oil, and thereby enhance U.S. security and strategic interests and reduce our trade deficit.

Policymakers should also encourage the direct use of natural gas for residential and commercial end uses such as space heating, water heating, and the like where the greater efficiency and lower emissions of natural gas (on a source to site basis) has been amply demonstrated.[15]

Given its clean burning nature, it is logical to assume that natural gas will also play a role in distributed and other power generation to decrease reliance on coal and complement clean, albeit intermittent, energy sources such as wind and solar. APGA observes that most electric generation built since 2000 is fueled with natural gas, and the EIA projects that most new electric generation plants will be fueled by natural gas,[16] which has obvious significance for the demand for natural gas in the immediate and long-term future. Finally, APGA observes that increased use of natural gas domestically in lieu of oil imports will benefit the U.S. economy by reducing our trade deficit.[17]

However, to accomplish our goal of energy independence, natural gas in the United States must remain plentiful and reasonably priced. Today U.S. consumers enjoy natural gas prices that are the product of both the new available supplies of natural gas and the fact that our natural gas market is largely limited to North America. If this trend is permitted to continue, then there is light at the end of the energy independence tunnel. The export of large quantities of domestic gas threatens our ability to obtain this goal because the key to greater use of natural gas in all sectors is that it remains affordable and avoids the volatility pitfalls of the past. That will only happen if we remain de-linked from the international market. We know that from experience; we should learn from that experience. The cost of ignoring that experience will be a lost opportunity to advance this Nation's essential energy independence and national security goals.

CONCLUSION

APGA is not against free trade, but when important policies collide, nations must make choices. U.S. policymakers must carefully consider and prioritize the use of domestic resources according to the national interest over both the short and long-terms. APGA submits that the decision to export LNG should be thoroughly vetted in the context of a national energy policy, and the wise policy choice by our elected officials, at this critical time in our history, is to limit exports of natural gas so that we may realistically pursue the greater goal of energy independence. Those who argue that this matter is not an either-or situation are wagering our long-term national well-being on short-term profits. We urge the Committee to carefully consider the adverse impact that exporting LNG will have on millions of homes and natural gas consumers in the U.S. who will feel the impact of higher prices resulting from exposure to the global export market. We thank you for the opportunity to submit testimony and look forward to working with the Committee on this important issue.

The CHAIRMAN. Thank you very much. Thank you all for your testimony. Let me ask a few questions here starting with you Dr. Medlock.

One of the issues that sort of is floating around this set of problems is whether this shale gas, this newly found abundant natural gas source, is just something that we in the United States and

[15] Review of Site (Point-of-Use) and Full-Fuel-Cycle Measurement Approaches to DOE/EERE Building Appliance and Energy Efficiency Standards, National Academies of Sciences (May 27, 2009) available at http://www.nap.edu/catalog.php?record id=12670.

[16] EIA, Annual Energy Outlook 2011 at 41 (Finding that in each cost scenario considered by the EIA, the majority of new electric generation capacity will be natural gas-fired.); see also, Mark Watson, Gas Generation to Double by 2020: Report, Electric Power Daily (July 12, 2011) (Reporting on an ICF International forecast that coal plant retirements, increased reliance on intermittent power sources, and the availability of shale gas will cause gas-fired electric generation to more than double between 2010 and 2030).

[17] For example, as recently reported, "[t]he trade deficit in the U.S. widened in May to the highest level in almost three years, reflecting a surge in the cost of imported crude oil. The gap grew 15 percent to $50.2 billion, exceeding all forecasts of 73 economists surveyed by Bloomberg News and the biggest since October 2008, Commerce Department figures showed today in Washington." Alex Kowalski, Trade Deficit of US Unexpectedly Surges on Increase in Crude-Oil Imports, Bloomberg News, (July 12, 2011).

Canada and perhaps Mexico, but North America have a corner on or whether this is really something that the rest of the world is going to find they've got just about as much as we've got. Are we in a circumstance where we're gearing up to export to markets that are going to find out that they've got plenty of what we're trying to export to them already or not?

Mr. MEDLOCK. Thank you for the question.

That's certainly a real risk that I'm sure companies involved both in the export projects and proposed from North America as well as shale gas exploration and development overseas are wrestling with. Certainly outside of North America there is shale. We know that.

As a matter of fact we knew shale existed here. It really was, when you think about the shale gas revolution in this country, it's a technological revolution because geologists have long been writing about shale formations and things such as gas in place. I've actually read dissertations in the annals of the AAPG that date back to 1971 on the Marcellus shale. So the existence of the formations was not new. It was really the application of new technologies.

Whether or not those technologies are transferrable abroad I think is not really the fundamental issue as to whether or not we see the type of development that we've seen in North America, outside of North America. I think probably the most off—underappreciated factor in what we've seen in this country has to do with market structure. In this country individual operators, some very small operators actually have the ability to develop acreage and access a market. There's very little to block entry, so to speak. If you go outside of North America, save for one country, and that's Australia, that's not the case.

So when we think about shale gas developments abroad certainly the potential is there, but there are things that are above ground, so to speak, that could really serve as long term impediments and open a window potentially for LNG exports.

The CHAIRMAN. OK.

Mr. Slaughter, did you have a point of view on that?

Mr. SLAUGHTER. I'd just like to say that if you look at the long term future of energy markets around the world. You might have seen the recent IEA report on the golden age of gas, this shows that natural gas will be one of the cornerstones of energy growth around energy demand growth around the world over the next 20 or 30 years. So that draws forth supply from all sorts of different options including from North America.

So we need to provide all sorts of alternative forms of supply of natural gas to the global market as well as to the North American market.

The CHAIRMAN. Let me just pursue that a minute. I assume Shell is actively pursuing opportunities to develop shale gas in lots of places in the world in addition to the U.S. Am I right?

Mr. SLAUGHTER. Yes, that's correct.

The CHAIRMAN. To the extent you're successful with that, our opportunity to export and the market for the export of shale produced LNG from the United States diminishes. Is that——

Mr. SLAUGHTER. That's not necessarily correct. What I was trying to get at in my previous answer was that the global market for

natural gas is growing. So it's opening up new opportunities for many sources of supply.

So it's not a zero sum game where you develop in Poland. You'd need to develop less in North America. There will be a bigger gas market in the world over the next several decades.

The CHAIRMAN. OK.

Mr. Collins, I gather from your testimony you think that we need to be very wary of approving increased exports of LNG because you think it's going to adversely affect the price that consumers have to pay for natural gas. Is that accurate?

Mr. COLLINS. That's correct. Yes.

The CHAIRMAN. You say that Congress needs to act. What do you propose Congress should do?

Mr. COLLINS. One of the things I think Congress should do is look at the NAT Gas Act that's been proposed. In that act there has been some funding available for infrastructure for natural gas fueling stations and also for vehicles. I think that's where we need to concentrate to get some of our funds available to the country to work on energy independence to get natural gas vehicles on the road.

One of the bill's sponsors proposed this legislation that has the potential to create 500,000 new jobs. I think that would have a——

The CHAIRMAN. But this is not legislation that would directly affect exports of natural gas out of the country. Instead it would increase the demand for natural gas here. Then indirectly, I guess, that does lessen the attractiveness of exports.

Is that accurate?

Mr. COLLINS. That's correct, yes. We feel that, APGA feels that in order to pursue energy independence that the United States should be looking at using natural gas internally not only for the direct use of natural gas for heating homes, industry, electric generation.

The CHAIRMAN. Alright.

Senator Murkowski.

Senator MURKOWSKI. Thank you, Mr. Chairman.

Mr. Slaughter, you are seemingly very bullish on natural gas. I appreciate that. I think the words that you used were, "deep confidence." Shell is demonstrating that by the investments in LNG export as well as the gas to chemicals facility that you are moving forward with in the Marcellus.

Talk to me about how geography will play a role in what happens with our natural gas development here in this country. Obviously when you have the resource, for instance, sitting there in West Virginia you can put a chemical, gas to chemical facility there. But in a more geographically remote location like Alaska without as many options for the value at it without the proximity to the market, what then happens with those business judgment decisions?

You've got the gas. What do you do?

Mr. SLAUGHTER. As you know we recognize that Alaska has huge energy resources and you know that Shell is working diligently to try and realize those opportunities as we have been for several years.

I think in terms of Alaska natural gas if you look at its relation to the market and to other markets I think you can envision a future where potentially the development of natural gas for export from Alaska can lead to the development of infrastructure which can anchor developments. Lead perhaps in the medium to longer term to integrate Alaska natural gas into the North American market more.

But clearly the geographical proximity to Asian markets is there. So it could be that that route allows Alaskan gas to be monetized earlier and develop the infrastructure to hook it up to systems which will connect with the North American market.

Senator MURKOWSKI. OK.

The discussion that has been going on in terms of the price in the global markets—and this is a question probably to you, Dr. Medlock, as well as you, Mr. Slaughter. You have indicated that it's not a zero sum game in terms of you develop here, you have to take it offline somewhere else. Discuss, if you would, the potential impact of North American LNG exports on the domestic natural gas price volatility.

Dr. Medlock, you kind of took us through our ECON 101, but we're getting a different perspective from Mr. Collins here. I'd like to have just a little bit more discussion on this.

Mr. MEDLOCK. Sure. Thanks for the question.

To make an argument that increasing LNG exports would drive the price of natural gas domestically up to parody with the world say, you're basically implicitly making 2 very critical assumptions.

The first one being that the domestic supply curve is not price responsive. So in other words we face capacity constraints with regard to how much new supply we can bring online in the face of growing demands and increasing prices.

The second one is that you're making an assumption that foreign supplies are also not necessarily going to respond to the introduction of new supplies from the North American market. So in effect what you're doing is you're arguing that some foreign suppliers won't be back out of the market which means the price there will effectively be unchanged. Yet consumers in North America will face much higher prices because effectively what you're doing is you're diverting natural gas molecules that would otherwise go to future consumption to current consumption overseas.

That in and of itself, is a pretty strong assumption. As a matter of fact no matter how many different ways we paint domestic supply and domestic demand and foreign supply and foreign demand, that's the only situation which you get that particular outcome. In every other single outcome, you really have to assume there are no constraints on export capacity, evaluate how much of the price action occurs in the foreign market and how much of the price action occurs in the domestic market.

So there could very well be a happy medium in which prices do indeed rise in North America. But they also fall abroad. It's more likely however given the abundance of natural gas resources and the shape of the supply curve for North American gas that there would be a capacity constraint on export potential, particularly if you think about a 6 BCF a day export arrangement.

In which case and this is a fundamental truth of any sort of an economic lesson that I've ever known or I've ever taught or been taught, the capacity constraint is where the rents accrue. So what you get across a capacity constraint is a wide differential in prices. So what means is if I have a very abundant supply of natural gas in North America if I constrain the amount of exports that are in place, say at 6.6 BCF a day, then you will actually see a pretty large gap between foreign and domestic natural gas prices.

Senator MURKOWSKI. Mr. Slaughter, very quickly.

Mr. SLAUGHTER. I'd echo what Chris Smith said in the first panel. Pricing dynamics in each of the major global markets, East Asia, Europe and North America are very different and depend on local conditions. Now an LNG export facility is a large capital expenditure, capital intensive facility. There are not going to be so many of them that you flip the balance in the domestic market between the dominance of domestic pricing dynamics verses international pricing dynamics.

Domestic supply/demand conditions will prevail given the relative size of the likely export market verses the huge and growing domestic market.

Senator MURKOWSKI. Thank you, Mr. Chairman.

The CHAIRMAN. Senator Wyden.

Senator WYDEN. Thank you, Mr. Chairman.

Mr. Collins, let me go back to this chart with the Wall Street Journal that I've been citing. Red line is spot prices for LNG in Asia. Green line natural gas futures prices here in the United States.

Now of course, you represent consumers, you know, business, folks who use natural gas to heat their home. What's the impact on your customers if you, as a natural gas distribution company in the market for purchasing for your customers. What does it mean for you all if you have to compete head to head with competitors in Asia or other parts of the world for natural gas supplies?

Mr. COLLINS. Thank you, Senator, for that question.

In the city of Hamilton the median income is about $35,000 per year. Right now at the 360 and MMBTU are $4. Natural gas is affordable for customers to heat their homes and also for businesses.

If the prices continue, if they increase to match international prices, it's going to be that much harder for families to heat their home, the businesses to compete with each other and the Nation.

Senator WYDEN. Let me ask a question for all of you because to me what I've been trying to get my arms around in this debate is trying to get an accurate picture of what the size of the export market is and what the impact is going to be on North American consumers. I was struck. A few weeks ago the National Petroleum Council issued a major report on the subject. The assessment assumed that North American exports of LNG would be 5 billion cubic feet a day base, not on any in depth analysis of what the potential export market would be but on the size of the first applications filed with the United States from the Canadian government.

So then we've had U.S. DOE and the Canadian National Energy Board approving applications already for more than that amount, significantly more than that amount. They've got pending applica-

tions that are double the amount that the Council assumed and more export terminals are in the works.

The reason I'm asking this is one, because I think it illustrates how uncertain the climate is on the 2 kinds of central questions. The size of the export market. What it's going to mean for consumers.

The Petroleum Council is a very professional outfit. This is not intended to say, oh they did something wrong or didn't look at the right factor or anything of the sort. What it reflects though is the, to me, the uncertainty of the fundamental facts that policymakers are going to have to sort through.

Why don't we just go down the row?

Mr. Collins, I've got a couple of minutes I guess from my round. Just your reaction to the analysis that I'm bringing on this, you know, question that there is an awful lot of uncertainty. It's why it seems to me policymakers ought to be doing what Chairman Bingaman and Senator Murkowski are doing here today which is try to get the facts so that when we start laying out some policies they're actually based on the most objective judgments about what's ahead in terms of the market.

Your reaction, just on this point.

Mr. Collins, Mr. Slaughter, just right down the row.

Mr. COLLINS. Thank you, Senator, for the question.

APGA's opinion on that policy is that Congress should move slowly. You know, right now we're looking at the EPA is doing a study on hydraulic fracking. What impacts that would have environmentally to the Nation with chemicals that are used during that process.

So as far as setting a limit or an amount that should be exported, I think we just need to move cautiously because we don't know exactly in the future. The reserves are there but we need to find a way to economically and safely extract the natural gas to be used.

Senator WYDEN. Mr. Slaughter.

Mr. SLAUGHTER. As a member of the National Petroleum Council Study Team which produced that report I can tell you that the export numbers that were built into that analysis were based on expert judgment on what we thought was likely to get developed. That's not necessarily the same number as the amount of which is permitted. You expect some attrition from permit to actual construction.

These are very high capital intensive projects. Not many companies have the ability to finance construction and operate these. So expect the actual number to be somewhat lower than the amount of permits that are issued.

The analysis that we came up with was that this did not stress the supply system. Certainly if you think of the growing market for natural gas in the North America that becomes a significantly lower percentage of the absolute total.

Senator WYDEN. Let me give your colleague a chance to respond as well. I just know, again, following in the press that Shell is looking at another big project that isn't even on the list. So again that's why I'm trying to get my arms around this.

Mr. MEDLOCK. Yes, certainly. I think what Andrew just indicated with regard to, you know, the license for export capacity and actually the volumes that move through the facilities is an important point to consider. I mean, you think about the quantity of import capacity that was actually approved for construction and constructed that now sits idle.

That really goes to show you that the economics of the issue is actually a very important issue to grapple with as well. So cost matters.

We can talk all day about the abundance of the resource base relative, you know, North America relative to everywhere else in the world and demand here relative to everywhere else in the world. But at the end it has to be cost effective or else it won't happen.

Senator WYDEN. Thank you, Mr. Chairman.

The CHAIRMAN. Senator Hoeven.

I just advise everyone we started a vote. So we'll try to have Senator Hoeven and then Senator Shaheen and then conclude the hearing. So go ahead.

Senator HOEVEN. Thank you, Mr. Chairman. I'm going to follow on a line of questioning I had with the former panel. I'm going to start with you, Mr. Slaughter.

We're producing more natural gas, as you've indicated. Our State is an example. But we actually produce it in developing our oil fields.

Mr. SLAUGHTER. Yes.

Senator HOEVEN. So what ideas do you have that we can implement? What can government do at the Federal level, particularly? But maybe also at the State level to draw on any examples that you've seen that have been successful or anything that Shell is doing?

What can we do from a legal tax and regulatory standpoint that will encourage private investment in the gathering systems and the transportation to capture gas that is now being flared off these oil wells and get it to market whether it's marketed domestically here in current uses and what you see as a transition, transitional uses for natural gas as we go forward or for export?

Mr. SLAUGHTER. I think that's a very good question. Thank you for that. What we have to realize here is that this is not a speculative future. This is actually happening right now.

The U.S. has added 15 BCF a day of incremental new gas supply over the last 5 years. So it's actually happening. Pipelines are getting developed and gathering systems are getting developed.

So I think what we would like to see is no new impediments to natural gas upstream development. I think that's the key thing. We have a system which seems to work in developing infrastructure. The major basins are getting connected to markets.

So as long as we operate and continue to operate in an environmentally responsible and safe way, I think we're looking for no new impediments to development.

Senator HOEVEN. So right now you feel that that legal tax and regulatory environment is conducive to the infrastructure development that you need to move the gas we produce from all these different markets around the country to some commercial use?

Mr. SLAUGHTER. It does seem to be happening from the major gas basins, yes. If you look at the Haynesville shale or the Marcellus shale there is a fairly substantial infrastructure build out to connect them to market.

Senator HOEVEN. OK. Thank you.

Dr. Medlock.

Mr. MEDLOCK. I would actually only echo that. It's sort of an echo really. With the current regulatory framework actually is very conducive to construction particularly of the interstate gathering and transportation network.

Intrastate, that's a bit more of a patchwork. So those are things that certainly wouldn't be addressable necessarily at the Federal level though. They would be tackled by State regulatory agencies.

But with regard to the ability to permit and construct long haul transportation that crosses State borders you actually don't see it happen anywhere in the world faster than it happens in the United States. It's actually a very clean system.

Senator HOEVEN. That's encouraging.

Mr. Collins, your thoughts?

Mr. COLLINS. As far as infrastructure one thing that we would like to see, as I mentioned earlier, the increased use of natural gas vehicles. In the city of Hamilton last year received a grant from Clean Fuels Ohio to convert 4 vehicles to natural gas. We're also in the process of constructing a public/private fueling station.

So we would like to see more tax credits, funding available for infrastructure for transportation sector.

Senator HOEVEN. Mr. Slaughter, can you give me any specific fields to look at where you think they've done a particularly good job as they've increased production, particularly in oil development of going in and working with the companies to encourage the capture of natural gas that's being flared or some examples that you would cite that we could look at?

Mr. SLAUGHTER. I'll get back to my upstream team and get you some examples. Yes. I don't have them right here today.

Senator HOEVEN. Same thing, Dr. Medlock? Any examples that you can think of as well as, again, any things that they've specifically done that have helped stimulate that private investment and make the transition?

Mr. MEDLOCK. I think one of the critical aspects, particularly with regard to your State and the 13 month license to flare when a new oil production facility comes online is the lack of gathering infrastructure. I think a lot of that relates to cost and the ability to actually move oil in a fundamentally different way because there's a lot of oil that's actually being moved by tank truck out of North Dakota right now which is, if you ask me, a very high cost way to transport oil. But the opportunity set is so large in North Dakota that they're doing it anyway.

Ultimately what needs to happen is there needs to be some sort of development of local use markets if that gathering infrastructure is not going to be developed to move it longer distances. Perhaps that's where, you know, State regulators or even at the Federal level there can be some involvement to encourage that kind of use.

Senator HOEVEN. So a real focus on the gathering of systems.

Mr. MEDLOCK. Yes.

Senator HOEVEN. You'd say that would be an area of emphasis.
Mr. MEDLOCK. Absolutely.
Senator HOEVEN. Thank you. Thank you, Mr. Chairman.
The CHAIRMAN. I would just mention. I think most States limit the number of days that you can flare when you're starting up an oil well.
I think in our State it's maybe 60 days. In your State it's 150. So one way to encourage people to hook up and use the natural gas instead of just flaring it is to shorten that time period.
Senator Shaheen.
Senator SHAHEEN. Thank you, Mr. Chairman.
My State of New Hampshire is in New England. In the Northeast we haven't used natural gas as you have in Ohio, Mr. Collins and much of the Midwest as much for heating our homes. Much of it has gone to power utilities, to provide generation.
Obviously we would be concerned, as I think you heard other members of the panel and talking about how the effect of exporting LNG might affect prices. I tried to listen pretty carefully to what each of you said on that issue. It didn't sound to me like there was unanimity coming from the panel about what that impact would actually be.
So, I guess, given that there is reason to be concerned about what the impact of pricing on gas would be here in America depending upon how much exporting is allowed.
So, Mr. Slaughter, you talked about the potential for LNG export. You used it in the context of when managed properly and I just wondered what you would include as proper management of that export.
Mr. SLAUGHTER. I think when managed properly we were talking about the operational aspects, the environmental aspects of operating, developing and operating an industrial facility. Clearly that's always at the top of our mind when we're looking at large investments of safety and environmental impact. I think that was the main point I was referring to there.
In terms of the price impact of LNG imports, again, I would come back to my export—sorry. I'd come back to my previous statement that this is likely to be a rather small percentage compared to the domestic market in North America in the U.S. The pricing dynamics that exist in the domestic market with multiple supply sources, very developed infrastructure, that should still dominate in terms of price formation in this market.
I do not expect this to migrate to an Asian type pricing regime.
Senator SHAHEEN. So when you were talking about proper management you were not talking about how the export market might be managed. You were more talking about how are we getting the gas out of the ground then.
Mr. SLAUGHTER. Yes.
Senator SHAHEEN. To follow up then in a couple of those areas. We did a hearing in the Water and Power Subcommittee of this committee a couple of weeks ago where we tried to focus specifically on some of the challenges in the Northeast where because of the population accessing the Marcellus shale is a little more problematic than in North Dakota, for example. One of the concerns that we heard was how chemicals are used and to what extent are

those identified for the public and how much transparency is available so the public actually knows that.

Wonder if you or Dr. Medlock, if you could comment on what you think is the most effective way to make sure that there is transparency about the chemical use.

Mr. SLAUGHTER. So I'll lead off on that. As you may know there is an industry initiative called Frack Focus where the chemical components of drilling and fracturing fluids are made transparent and available to the public. They are listed by participating companies. We're in favor of increased transparency in that regard because the chemical components of a fracking fluid tend to be a rather small percentage, but it's important for people to know what they are.

The industry is a process of developing these platforms for transparency like Frack Focus or following local legislation like in the State of Texas which now has a legislative requirement to disclose. We're in favor of that.

Senator SHAHEEN. I appreciate that. I think that's very important. My recollection though and I don't remember the numbers exactly, but that the people who are actually disclosing on Frack Focus were a very small percentage of the amount of fracturing that was going on. So, you know, one of the things we quizzed people about was whether this should be regulated as you point out, Texas has just done that whether the voluntary approach was really working.

I don't know, Dr. Medlock do you have in my 10 seconds that I have left, do you have a perspective on this?

Mr. MEDLOCK. I think it would be nice if we could envision a world where voluntary transparency was the rule of law, so to speak. But unfortunately that's not necessarily the case always. So I think at the end of the day adopting measures like those that have been adopted in the State of Texas is something that either each State or something at the Federal level is ultimately going to have to be done to ensure that transparency is truly followed.

Senator SHAHEEN. Thank you all very much.

The CHAIRMAN. I believe our vote is coming to a close. So we need to get to the floor.

Thank you all very much. I think it's been very useful testimony. That will conclude our hearing.

[Whereupon, at 12:29 p.m., the hearing was adjourned.]

APPENDIXES

APPENDIX I

Responses to Additional Questions

RESPONSE OF CHRISTOPHER SMITH TO QUESTION FROM SENATOR BINGAMAN

Question 1. According to the Natural Gas Act, the Department of Energy has the ability to deny applications to export natural gas to countries with which the U.S. does not have a standing Free Trade Agreement, if DOE finds the export to not be in the public interest. The United States has trade obligations under other international agreements, such as those arising from membership in the World Trade Organization. When reviewing an export application, what criteria does the administration use to decide whether its decision is consistent with United States obligations under international agreements?

Answer. DOE's authority to regulate imports and exports of natural gas arises under section 3 of the Natural Gas Act. Section 3(c) of the Natural Gas Act, as amended in 1992, provides that applications for authority to import or export natural gas from or to most nations with which the United States has entered into a free trade agreement must be granted without modification or delay. With respect to other countries, Section 3(a) of the Natural Gas Act requires DOE to grant an export application unless DOE finds that the proposed export is not consistent with the public interest. DOE takes international obligations seriously, in addition to other factors, in conducting its public interest analysis. In an order issued May 10, 2011 in Sabine Pass Liquefaction, LLC, FE Docket No. 10-111-LNG, for example, DOE conducted its own review of applicable laws, reviewed all of the pleadings submitted in the proceeding before it, and consulted with other executive branch agencies, as necessary, to ensure consistency with United States international trade obligations.

RESPONSES OF CHRISTOPHER SMITH TO QUESTIONS FROM SENATOR WYDEN

Question 1. In DOE's decision to approve the first big LNG export terminal export—Sabine Pass—DOE accepted the applicant's analysis on the impact that raising natural gas prices by more than 10% meets the public interest test required by the Natural Gas Act. While your testimony today is that DOE has commissioned two studies of export impacts, I am still uncertain of the criteria that DOE uses to determine whether or not a proposed export meets the Natural Gas Act test. What are the Department's formal or informal criteria for determining whether an export meets the public interest test? How were these criteria developed?

Answer. Section 3(a) of the Natural Gas Act creates a rebuttable presumption that a proposed export of natural gas is in the public interest, and requires DOE to grant an export application unless DOE finds that the record in the proceeding of the application overcomes that presumption.

The criteria used in a public interest review, which were developed within DOE, include, to the extent determined to be relevant or appropriate: domestic need for the natural gas proposed for export; adequacy of domestic natural gas supply; U.S. energy security; the impact on the U.S. economy (GDP), consumers, and industry; job creation; U.S. balance of trade; international considerations; environmental considerations; consistency with DOE's long-standing policy of promoting competition in the marketplace through free negotiation of trade arrangements; and other issues raised by commenters and/or interveners deemed relevant to the proceeding.

Question 2. Your testimony today was that DOE believes that the Natural Gas Act creates a rebuttable presumption that the export should be approved unless "DOE finds that the record in the proceeding of the application overcomes the pre-

sumption." What is DOE's role and obligation to develop a complete record that could support a negative finding? To what extent does DOE depend on intervenors in the case to develop the record to support a negative finding and to what extent does DOE have a burden to develop and document adverse conditions and facts that result from the proposal?

Answer. With respect to applications to export natural gas to countries with which the United States does not have a free trade agreement providing for the national treatment for trade in natural gas, the burden under Section 3(a) of the Natural Gas Act is, in the first instance, on interveners and protesters to introduce evidence that overcomes the statutory presumption that the application is consistent with the public interest. Where deemed necessary or appropriate, DOE has taken and will continue to take administrative notice of additional evidence in the public record to ensure that a complete record is developed. Additionally, because of the potentially far-reaching implications of recent applications to export liquefied natural gas to non-free trade agreement countries, DOE is preparing a cumulative impacts study which it intends to make part of the records for review and comment by parties in pending and future proceedings where such export authority is being requested.

With respect to applications arising under Section 3(c) of the Natural Gas Act, i.e. applications to import or export natural gas, including LNG, from or to countries with which the United States has entered into a free trade agreement providing for national treatment for trade in natural gas, or to import LNG from other international sources, DOE does not conduct a public interest review. Since the amendment of Section 3(c) by the Energy Policy Act of 1992, those applications have been deemed by statute to be in the public interest and DOE is required to grant them without modification or delay.

Question 3. North American natural gas markets and transmission systems are interconnected. The National Energy Board of Canada recently approved a 1.4 billion cubic feet per day export authorization from British Columbia. To what extent are the analyses that DOE has commissioned to examine the impacts of LNG exports analyzing the role that Canadian and Mexican natural gas markets and regulatory decisions, such as the recent NEB export authorization, have on the cumulative effects of LNG exports and the public interest test? To what extent does DOE consider developments in Canada and/or Mexico, such as the impact of NEB export authorizations, in determining the Natural Gas Act public interest test?

Answer. DOE is aware of the recent NEB authorization, as well as other applications before the NEB, to export North American natural gas as LNG from British Columbia, Canada. The DOE-commissioned studies that will address the cumulative impact of LNG exports include sensitivity analyses of LNG exports with volumes in excess of those applications received by DOE, which could be used to approximate the impact of U.S. and Canadian exports.

Question 4. There are a variety of factors that determine the price that consumers pay for natural gas, including constraints on pipeline capacity and wellhead prices. What factors did DoE take into account when calculating the impact of additional export licenses on domestic prices? Did DoE consider the impact on consumer prices or wellhead prices alone? Has DoE taken into account regional differences—for example, did DoE consider differences between exports from Alaska versus Gulf of Mexico regions? Did DoE look at factors creating seasonal pricing between consumer prices and wellhead prices?

Answer. DOE has commissioned studies from EIA and a private contractor to review these issues but it has not yet received the results of the studies. The EIA study will use the National Energy Modeling System (NEMS), which incorporates current pipeline constraints, and reflects prices throughout the entire value chain from wellhead to end-user. The private contractor study will evaluate the macroeconomic impact of LNG exports using a general equilibrium model of the U.S. economy, and will incorporate the EIA case study output from NEMS. The contractor study will also evaluate the impact that LNG exports could have on multiple economic factors, but primarily on U.S. gross domestic product (GDP), employment, and real income. The focus of the studies is on the impact of natural gas exports from the lower-48 states on an annual basis through 2035, and will not show seasonality. The studies also will not evaluate LNG exports from Alaska.

Question 5. Shale gas is a new source of natural gas. Estimates of proved resources have already been adjusted by the Energy Information Administration. How has the uncertainty of this supply affected your analysis of the domestic impact of these export licenses?

Answer. DOE continues to monitor the Energy Information Administration's (EIA) estimates of domestic shale gas resources and reserves, as well as ongoing resource assessments developed by others. The DOE-commissioned studies that will address

the cumulative impacts of LNG exports will include a sensitivity analysis that addresses supply uncertainty.

RESPONSES OF CHRISTOPHER SMITH TO QUESTIONS FROM SENATOR COONS

Question 1a. Domestic supplies of natural gas are increasing and market demand is growing. Additionally, natural gas has become a bridge fuel for achieving a more secure, lower carbon economy in several ways. For example, natural gas can help with renewable energy intermittency. The market is also driving conversion of vehicle fleets to natural gas, and increasingly, coal-fired plants are shifting to natural gas because of emissions requirements. Further, natural gas is and always will be very important to the manufacturing and chemical industry.

In your view, is the role of the federal government strategically focused enough from a policy perspective to oversee and encourage the use of natural gas in various, relevant domestic and international markets?

Answer. The federal government is sufficiently and strategically focused from a policy perspective to oversee and encourage the use of natural gas in various, relevant domestic and international markets. As further described below, the Department of Energy (DOE) and other federal agencies are addressing key policy issues concerning the oversight and advancement of domestically-produced natural gas, and this coordinated effort will enable expanded domestic production and economic growth, support energy security and bolster our standing within the international community.

The Secretary of Energy Advisory Board (SEAB) Natural Gas Subcommittee recently released a report identifying critical strategic issues and recommendations to support and enable expanded domestic production of natural gas from shale gas formations while ensuring that activities are conducted in an environmentally responsible manner. The National Petroleum Council is concluding a study of the natural gas resources in North America which will also inform policy and technical issues associated with development activities.

DOE is working with the Council of Environmental Quality, the Department of State, the Department of the Interior and the Environmental Protection Agency through an interagency workgroup to establish the policy and regulatory frameworks to encourage and monitor domestic natural gas development. The Department of State's Global Shale Gas Initiative is developing and will share with the international community governmental and industry insights, expertise, and institutional capabilities that enable safe, sustainable, and economic extraction and development of unconventional natural gas resources. The Environmental Protection Agency is conducting a study of the technical aspects of the development of unconventional natural gas resources and, along with the Department of the Interior study of the technical aspects of offshore natural gas development, will assist in the framing and addressing of critical policy issues. Other country-specific bi-lateral programs are being initiated by the Department of State to share U.S. expertise and experience in assessing and developing conventional and unconventional natural gas resources and will include joint technical studies, technical workshops, site visits, and other exchanges facilitated through bi-lateral forums and with the assistance of various Federal agencies.

Question 1b. Domestic supplies of natural gas are increasing and market demand is growing. Additionally, natural gas has become a bridge fuel for achieving a more secure, lower carbon economy in several ways. For example, natural gas can help with renewable energy intermittency. The market is also driving conversion of vehicle fleets to natural gas, and increasingly, coal-fired plants are shifting to natural gas because of emissions requirements. Further, natural gas is and always will be very important to the manufacturing and chemical industry.

What considerations are made when considering the tradeoffs of exports vs. domestic use—among them reducing gas price volatility, determining the balance of trade, creating jobs, counteracting geopolitical influences, producing higher valued domestic goods?

Answer. A wide range of criteria are considered as part of DOE's public interest review process, including, to the extent deemed relevant or appropriate: domestic need for the natural gas proposed for export; adequacy of domestic natural gas supply; U.S. energy security; the impact on the U.S. economy (GDP), consumers, and industry; job creation; U.S. balance of trade; international considerations; environmental considerations; consistency with DOE's long-standing policy of promoting competition in the marketplace through free negotiation of trade arrangements; and other issues raised by commenters and/or interveners deemed relevant to the proceeding.

Question 2a. The U.S. is now the world's largest natural gas producer. We are fortunate to have an abundant supply of natural gas, and our manufacturing economy needs to continue to develop those resources. However, demands can outpace supply without careful consideration. Recent reports from the Energy Information Administration have estimated very modest demand growth for natural gas in the U.S. in the next few years. At the same time, the National Petroleum Council issued a recent report that concluded that the North American natural gas resource potential is so large that it can supply "even the highest demand scenario."

What should be the take away for policymakers in terms of utilizing natural gas for the transportation sector or export market without creating economic distortions for other consuming industries?

Answer. The abundance, low cost, and domestic supply of natural gas makes it an increasingly attractive candidate for captive fueling applications (DOE Quadrennial Technology Review (QTR) p. 63), where vehicle fleets with their own fueling infrastructure could benefit from specialized fuels. However, these are specialized applications, and technology pathways that leverage existing infrastructure are more likely to succeed in mass markets. (DOE QTR, p. 49) With respect to LNG export applications, DOE considers a number of criteria as part of its public interest review. This includes the domestic need for the gas proposed for export, as well as the impact of the proposed export on the economy, consumers, industry, and domestic natural gas prices.

Question 2b. The U.S. is now the world's largest natural gas producer. We are fortunate to have an abundant supply of natural gas, and our manufacturing economy needs to continue to develop those resources. However, demands can outpace supply without careful consideration. Recent reports from the Energy Information Administration have estimated very modest demand growth for natural gas in the U.S. in the next few years. At the same time, the National Petroleum Council issued a recent report that concluded that the North American natural gas resource potential is so large that it can supply "even the highest demand scenario."

Other countries in Asia (China), Europe (Poland), and South America (Brazil and Argentina) are expected to develop shale gas reserves in the future. Do you think that this will dampen the low-cost advantage that the U.S. currently has for domestic exports right now? Is the federal government taking these new reserves into consideration when considering its permit approvals?

Answer. Potential future shale gas resource development is one of many global natural gas supply and demand factors that can affect global natural gas price markets. DOE's focus in reviewing LNG export applications is principally on the domestic impact of natural gas exports on the public interest, and it has not considered potential future global shale gas resource development.

Question 2c. The U.S. is now the world's largest natural gas producer. We are fortunate to have an abundant supply of natural gas, and our manufacturing economy needs to continue to develop those resources. However, demands can outpace supply without careful consideration. Recent reports from the Energy Information Administration have estimated very modest demand growth for natural gas in the U.S. in the next few years. At the same time, the National Petroleum Council issued a recent report that concluded that the North American natural gas resource potential is so large that it can supply "even the highest demand scenario."

Has the federal government looked at whether there is enough natural gas to satisfy the diversity of demand? Are there regional differences in terms of export potential?

Answer. As part of the public interest review process for LNG exports, DOE considers the adequacy of domestic natural gas supply and the domestic need for the natural gas proposed to be exported among the review criteria. DOE will continue to monitor future assessments of domestic natural gas supply and demand.

There are regional differences in terms of LNG export potential to the extent that LNG export facilities are not currently proposed for every geographic region of the United States.

Question 2d. The U.S. is now the world's largest natural gas producer. We are fortunate to have an abundant supply of natural gas, and our manufacturing economy needs to continue to develop those resources. However, demands can outpace supply without careful consideration. Recent reports from the Energy Information Administration have estimated very modest demand growth for natural gas in the U.S. in the next few years. At the same time, the National Petroleum Council issued a recent report that concluded that the North American natural gas resource potential is so large that it can supply "even the highest demand scenario."

What factors are weighed when considering the benefit of exporting a raw material (natural gas) or a finished product in the form of chemicals and higher valued goods?

Answer. The potential benefits of exporting a product, whether a raw material or finished product, would be to stimulate new domestic economic activity as the exporting industry expands to produce more of the product for the new export market. This could result in more jobs, and new Federal, state, and local tax revenues paid by the exporting industry and the new workers. It could also benefit the U.S. trade balance by adding new revenues to the domestic economy from foreign entities buying the exported product. Additionally, DOE considers the domestic need for the natural gas proposed for export as part of its public interest review process.

In order to address the potential cumulative impact of a grant of pending LNG export applications to non-free trade agreement countries, DOE has commissioned two case studies: one by the EIA and the other by a private contractor. These studies will address the impacts of additional natural gas exports on domestic energy consumption, production, and prices, as well as the cumulative impact on the U.S. economy, including the effect on gross domestic product, job creation, and balance of trade, among other factors. We anticipate these studies will be completed no later than the first quarter of calendar year 2012.

RESPONSES OF CHRISTOPHER SMITH TO QUESTIONS FROM SENATOR MURKOWSKI

Question 1. Mr. Smith, several studies have emerged on the size of the gas resource and it seems to me this is a key fundamental in determining our capacity for export. DOE has even sanctioned some of this work in assessing the resource. Apart from EIA's, can you outline which estimates—whether MIT, PGC, ICF, NPC—also inform DOE policy? Is it accurate that these estimates don't contain any undiscovered gas, such as that in underexplored places like Alaska as well as the Antrim and Utica shales?

Answer. DOE utilizes various reference sources in its efforts to stay up-to-date in understanding U.S. natural gas resources, and is aware of the above mentioned studies. It is DOE's understanding that natural gas estimates in these studies do, in fact, contain undiscovered gas.

Question 2. What attributes of Alaska's resource base and its geography seem to place it in a distinct position from the rest of the US in terms of its export options?

Answer. Alaska has a large natural gas resource base that is closer to Pacific Basin LNG importing countries compared to other states with respect to LNG export options.

Question 3. To be clear, is it accurate that licenses for LNG export are concerned with dry gas, not the natural gas liquids (NGVs) which many of our industrial consumers need as a feedstock?

Answer. Section 3 of the Natural Gas Act gives authority to the Secretary of Energy to regulate the export of natural gas, including liquefied natural gas. DOE has no authority under section 3 of the Natural Gas Act to regulate the export of Natural Gas Liquids (NGLs), such as ethane, propane, or butane.

Question 4. Finally, can you outline the authority DOE can preserve over export licenses to ensure we aren't getting into a situation where terminals are locked into long term contracts even if export were suddenly taking place during a national and/or energy security crisis?

Answer. In the event of an emergency natural gas supply shortage, the Natural Gas Policy Act (NGPA) provides for implementation of curtailment priorities in order to protect high priority users, including residential and small commercial consumers. If the curtailment priorities are exhausted, the NGPA authorizes the President to declare a natural gas supply emergency and to make emergency purchases of natural gas. If those efforts still are not enough to protect high priority users, the President may issue emergency orders allocating gas supplies.

In the event of an unusual or extraordinary threat, the President is authorized by the International Emergency Economic Powers Act to declare a national emergency and to investigate, regulate, or prohibit any importation or exportation of any property in which any foreign country or a foreign national has any interest by any person, or with respect to any property, subject to the jurisdiction of the United States.

The Energy Policy and Conservation Act, at 42 USC 6212, provides the President with additional independent rulemaking authority to restrict exports of natural gas.

After opportunity for a hearing and for good cause shown, DOE is also authorized by section 3 of the Natural Gas Act to issue supplemental orders modifying or rescinding prior orders to protect the public interest. Additionally, DOE is authorized by section 16 of the Natural Gas Act "to perform any and all acts and to prescribe, issue, make, amend, and rescind such orders, rules, and regulations as it may find necessary or appropriate" to carry out its responsibilities.

RESPONSES OF JEFF C. WRIGHT TO QUESTIONS FROM SENATOR WYDEN

Question 1. While FERC has approved a number of import terminals on the assumption that they were needed to provide additional regional supply, such as its approval of Jordan Cove to meet Northwest demand, exports will not provide such supply and may, in fact, reduce supply and raise prices in regional markets as U.S. consumers compete with off-shore buyers. What are FERC's criteria for assessing the need for export facilities in meeting regional energy needs? What precedent is there for finding that an export facility can meet the Commission's obligations to determine the need for a facility under the Natural Gas Act and under the National Environmental Policy Act?

Answer. The Commission has not yet acted on any of the proposed projects to export LNG. Similar to the processing of an import terminal, I expect that the Commission would develop a complete record regarding any proposed LNG export terminal, including any available information on the impact of a proposed facility on regional energy markets. In my experience, the Commission has no preconceived criteria in this regard, but bases its decisions on the evidence before it. It is important to note, however, that the authority to approve or deny applications to import or export natural gas resides with the Department of Energy (DOE) and it is DOE that is responsible for determining whether the exportation of natural gas, in particular, is consistent with the public interest.

Question 2. In approving import terminal applications, the Commission assumed economic and environmental benefits from these import facilities which no longer appear valid. When the Commission considers applications for conversion of import terminals for export purposes, will the Commission discount these previously assumed benefits in meeting its obligations under both the Natural Gas Act and NEPA?

Answer. Commission decisions regarding LNG import and export terminal applications, as with all of the Commission energy infrastructure decisions, are made on the basis of the complete record before the Commission, I anticipate that the Commission will act on any future LNG export terminal applications based on the best information available at that time.

Question 3a. In December 2009, FERC approved the Jordan Cove LNG import terminal in Coos Bay, Oregon over the objections of the State of Oregon and other intervenors who argued that Northwest natural gas needs could be met with North American supplies. In your testimony today, you reiterated that there was a need for imported gas at the time the staff and the Commission approved the project despite evidence presented by the State. Indeed, the Commission's December 17, 2009 order goes to great lengths to justify a need which not only did not materialize, but which the applicant has now determined no longer exists and that the terminal should export an even greater amount of gas.

Given the fact that the staff and the Commission clearly erred in accepting and defending the needs assessment for the project, why should the original authorization be sustained?

Answer. The Commission is currently considering requests for rehearing of its decision on the Jordan Cove LNG project. As a pending proceeding before the Commission, the staff cannot comment on the substance or merits of the Jordan Cove LNG project.

Question 3b. Will the Commission reconsider the original Jordan Cove order and/or needs assessment either on its own or as part of an application to modify the facility for export? If not, why not?

Answer. I cannot comment on Commission action with respect to the original Jordan Cove order, because requests for rehearing of that order are pending before the Commission. Should Jordan Cove file an application to modify the proposed facility for export, Commission staff will analyze all issues relevant to that application.

Question 3c. The original Jordan Cove authorization was for a terminal capable of handling the equivalent 1.0 billion cubic feet a day of natural gas. The export permit application for Jordan Cove is for the equivalent of 1.2 billion cubic feet per day. To what extent will FERC require review of the original safety, marine transit, environmental, operational and security requirements of the facility in light of the significant increase in plant capacity proposed by the applicant?

Answer. Jordan Cove has not filed an application with the Commission to change either the terminal capacity or its status from an import terminal to an export terminal. If such an application is filed, the Commission would conduct an analysis of the impacts associated with the proposed modifications, including issues related to siting, construction, and operation.

RESPONSES OF JEFF C. WRIGHT TO QUESTIONS FROM SENATOR COONS

Question 1. Domestic supplies of natural gas are increasing and market demand is growing. Additionally, natural gas has become a bridge fuel for achieving a more secure, lower carbon economy in several ways. For example, natural gas can help with renewable energy intermittency. The market is also driving conversion of vehicle fleets to natural gas, and increasingly, coal-fired plants are shifting to natural gas because of emissions requirements. Further, natural gas is and always will be very important to the manufacturing and chemical industry.

a. In your view, is the role of the federal government strategically focused enough from a policy perspective to oversee and encourage the use of natural gas in various, relevant domestic and international markets?

b. What considerations are made when considering the tradeoffs of exports vs. domestic use—among them reducing gas price volatility, determining the balance of trade, creating jobs, counteracting geopolitical influences, producing higher valued domestic goods?

Answer. With respect to the construction of LNG and other natural gas projects, the Natural Gas Act focuses on Commission review of individual projects, rather than on broader strategic issues. Consequently, I have no views on these matters.

Question 2. The U.S. is now the world's largest natural gas producer. We are fortunate to have an abundant supply of natural gas, and our manufacturing economy needs to continue to develop those resources. However, demands can outpace supply without careful consideration. Recent reports from the Energy Information Administration have estimated very modest demand growth for natural gas in the U.S. in the next few years. At the same time, the National Petroleum Council issued a recent report that concluded that the North American natural gas resource potential is so large that it can supply "even the highest demand scenario."

a. What should be the take away for policymakers in terms of utilizing natural gas for the transportation sector or export market without creating economic distortions for other consuming industries?

b. Other countries in Asia (China), Europe (Poland), and South America (Brazil and Argentina) are expected to develop shale gas reserves in the future. Do you think that this will dampen the low-cost advantage that the U.S. currently has for domestic exports right now? Is the federal government taking these new reserves into consideration when considering its permit approvals?

c. Has the federal government looked at whether there is enough natural gas to satisfy the diversity of demand? Are there regional differences in terms of export potential?

d. What factors are weighed when considering the benefit of exporting a raw material (natural gas) or a finished product in the form of chemicals and higher valued goods?

Answer. As noted above, questions regarding the nation's strategic energy planning are beyond the limited authority granted the Commission with respect to the construction of natural gas facilities.

RESPONSES OF JEFF C. WRIGHT TO QUESTIONS FROM SENATOR MURKOWSKI

Question 1a. Mr. Wright, as your testimony notes, The Commission's review process is identical for either LNG import or export terminals.

Can you clarify for me then, may a terminal go through both reviews at once if it is an identical review?

Answer. Yes. If an applicant proposes to construct an LNG facility project capable of both import and export operations, the application to the FERC would have to provide the requisite information for all the project facilities and services, and the project would be reviewed in its entirety. While the review process is the same, the scope of the Commission staff's safety and environmental review is based on the equipment being proposed. Some equipment, such as storage tanks, pumps, and marine berths, would be required for either import or export. The primary differences would be related to the equipment needed for natural gas sendout for an import facility (e.g., vaporizer and high-pressure LNG pumps) and the liquefaction facilities needed for export.

Question 1b. If so, may an existing terminal switch back and forth between import and export easily?

Answer. If an LNG terminal receives the necessary approvals from the Commission and DOE for both import and export, no further approvals would be needed to switch between operations. An LNG terminal could physically switch back and

forth between import and export operations if all the necessary equipment exists to provide both services.

Question 1c. How much of that review process needs to be repeated if an expansion of import or export capacity is sought?

Answer. The project sponsor would have to apply to both FERC and DOE to change facilities and/or purpose of the LNG terminal. The extent of Commission review that would be required would depend on the extent and impacts of the proposed expansion.

Question 2. Mr. Wright, can you provide for the record a description of the way LNG behaves physically—how it must be handled, whether it is as dangerous as gasoline or other energy products, and what risks it carries in the event of a leak or spill?

Answer. Natural gas becomes a liquid (LNG) at -260°F and therefore as LNG it must be processed and stored in materials suitable for these low (cryogenic) temperatures. LNG vaporizes rapidly when exposed to ambient heat sources such as water or soil, and typically the vapors would travel in the direction of the prevailing wind, continuously mixing with the warmer air, until the vapors become lighter than air and are dispersed below flammable levels. The principal hazards are the heat from a fire following an accidental release of LNG that either forms a pool fire or flammable vapor cloud. (I would note that the accidental release of LNG is extremely rare.) In addition, LNG, as well as fuels such as butane, ethane, and propane, is categorized by the Coast Guard as a high consequence cargo which can pose a threat to maritime safety and security. Extensive coordination is done with the Coast Guard in determining if a waterway is suitable for LNG transit.

With the exception of the fact that LNG fires would likely burn hotter than a similar-sized petroleum fire, the hazardous properties associated with LNG are not markedly different than other fuels. However, because LNG rapidly evaporates and is dissipated in the air, a spill of LNG does not pose the same sorts of long-lasting environmental consequences on land or in the marine environment that have resulted from spills of petroleum fuels.

RESPONSES OF KENNETH B. MEDLOCK, III, TO QUESTIONS FROM SENATOR COONS

Question 1a. Domestic supplies of natural gas are increasing and market demand is growing. Additionally, natural gas has become a bridge fuel for achieving a more secure, lower carbon economy in several ways. For example, natural gas can help with renewable energy intermittency. The market is also driving conversion of vehicle fleets to natural gas, and increasingly, coal-fired plants are shifting to natural gas because of emissions requirements. Further, natural gas is and always will be very important to the manufacturing and chemical industry.

In your view, is the role of the federal government strategically focused enough from a policy perspective to oversee and encourage the use of natural gas in various, relevant domestic and international markets?

Answer. Domestically, natural gas has become such an important fuel to so many different stakeholders in the US economy precisely because of government action. Beginning with the Natural Gas Act in the late 1970s the US government has, through various regulatory agencies, transformed the natural gas industry in a profound manner. The industry used to be characterized by long-term take-or-pay contracts between producer and consumer—a model that still holds in Asia and is beginning to unravel in Europe. This limited the ability of small producers to enter the market. However, a series of regulations have created in the US natural gas market what is perhaps the most efficient market in the world, and it serves as a model for other governments and regional interests, such as the current efforts in the EU. The regulations include, but are not limited to, the moves to (i) unbundle transportation capacity from pipeline ownership, (ii) establish a market for tradable capacity rights, (iii) establish regulatory oversight to limit monopoly power of pipeline developers by regulating rates of return on new facilities and establishing procedures for soliciting pipeline capacity interest from third parties, and (iv) allowing hub services to evolve so that spatial and temporal arbitrage opportunities could be seized. Over the last couple of decades, the market transformation has fostered market entry by small producers, which is an important point considering it is the entrepreneurial endeavors of the independent producers in the US that triggered the movement to commercial shale development.

In my opinion, it is important that the government not undo what it has done. In other words, by establishing the market rules in the manner it has, the opportunity for entry and the proper market signals are not masked. Absent this, we could easily revert to a market that results in inefficient distribution and use of nat-

ural gas. It is also important that the government not take steps that could lead to consolidation in the upstream in the interest of scale overcoming new cost burdens. This would undermine the very force that led to shale gas development. By the same token, there are certain low cost polices that could achieve the level of regulatory oversight that is needed to ensure this is done safely—regulations aimed at mandating transparency is one example. Efforts should be directed at identifying these and acting on them.

Internationally, encouraging a replication of the regulatory and market structures in place in the US would do a lot to encourage broader market development in other countries. This could serve both economic and environmental goals, again, if done properly, and is something we have written extensively on at the Baker Institute. Here again, the US could take a leadership role in establishing regulations governing shale gas development that are sorely needed.

Question 1b. What considerations are made when considering the tradeoffs of exports vs. domestic use—among them reducing gas price volatility, determining the balance of trade, creating jobs, counteracting geopolitical influences, producing higher valued domestic goods?

Answer. This is a very interesting question. It is apparent that a battle among special interests has emerged in the wake of the recent supply growth we are witnessing in the US. Specifically, this conflict is basically rooted in who gets the rents. On the one hand, producers see high prices overseas and they believe they can capture a substantially higher price for their supplies by shipping to those markets. On the other hand, large industrial consumers see an opportunity to capture low cost supplies to export an intermediate or finished product to an international market that may be losing the ability to compete. Both premises are flawed because they rely on a set of assumptions that are inconsistent.

Producers argue that highly elastic domestic supply will enable an increase in exports without a large increase in price. There is little available data to dispute this claim, and in fact, elastic supply is important for producers and consumers alike. However, an increase in exports adds liquidity to the international market, which will reduce price abroad and pressure traditional pricing paradigms.

The current price differential between Asia and the US garnered much attention at the hearing. In the short run, the current high price in Asia and Europe has been largely driven by the wake of the disaster at Fukushima. Japanese consumers were forced to buy as many available cargoes of LNG to provide electricity to domestic consumers. This resulted in the global LNG market approaching its capacity limit, which is why prices have increased. Any relaxation of this inelastic supply condition will result a rapid decline in price abroad, not a rise in price domestically.

In short, it is also important to consider the elasticity of supply in other countries because international trade is a two-way conversation. The total liquefied natural gas trade in 2010 was about 30 billion cubic feet per day. This stands to grow in the next couple of years, but even so, if the US were to enter this market in the scale indicated by applications for license to export, it would have a significant impact on global gas trade—it would add an increment of about 20% to the current market. This is actually an important factor when trying to understand the potential influence on price volatility, balance of trade, and geopolitical impacts. Lower international price reduces the rents flowing to current exporters and diminishes the likelihood of other suppliers entering the market. This is something we have written about at the Baker Institute—most recently in a DOE sponsored study entitled "Shale Gas and US National Security" (2011),* which is attached hereto for reference. Importantly, the act of exporting natural gas from the US would also, by corollary, reduce the rents of the activity and thus reduce the incentive to export.

Regarding price volatility, in a paper written for the National Commission on Energy Policy and the American Clean Skies Foundation (also attached for reference)* I demonstrated that allowing trade does not increase volatility; rather, it reduces it. Moreover, concerns about a linkage to oil market volatility are misguided. First, annualized oil price volatility over the last 30 years, except 2008, has been consistently lower than natural gas price volatility in the US. In fact, this is why many large consumers in Europe were willing to purchase gas on an oil-indexed basis, because it ties the price to a commodity that is many times more liquid and hence fungible.

As for consumer groups, they usually argue that exports will raise both price and volatility, and thereby reduce the competitive advantage they seek. The principle is flawed, however, because data do not support that supply is relatively inelastic, which is what would have to be the case for their claim to be true. To carry the argument to its end, they then typically argue that the abundant domestic resource

* Documents have been retained in committee files.

should be used to grow domestic manufacturing and industry, but this would also increase domestic natural gas demand. Thus, the result higher demand in the model they offer would be the same given their conjecture about exports—higher prices and higher volatility. The argument has a fatal inconsistency.

Repeating a point I made in answering question 1, the US government and federal regulatory agencies have done a wonderful job of designing and regulating the US natural gas market over the last couple of decades, and natural gas as a result has grown in importance to the US economy. One has to ask "what evidence is there to change it?"

Question 2a. The U.S. is now the world's largest natural gas producer. We are fortunate to have an abundant supply of natural gas, and our manufacturing economy needs to continue to develop those resources. However, demands can outpace supply without careful consideration. Recent reports from the Energy Information Administration have estimated very modest demand growth for natural gas in the U.S. in the next few years. At the same time, the National Petroleum Council issued a recent report that concluded that the North American natural gas resource potential is so large that it can supply "even the highest demand scenario."

What should be the take away for policymakers in terms of utilizing natural gas for the transportation sector or export market without creating economic distortions for other consuming industries?

Answer. The takeaway should be one of cautious optimism. The government should allow existing regulations regarding transportation and domestic natural gas trade to function as they are currently designed. For consumers, effectively subsidizing one industry by acting to discourage another is distortionary by definition, so this has to be weighed in the calculus of action.

On the upstream end, it is important that the US government not be heavy-handed, and considers regulations that would encourage transparency and a level of oversight to ensure it. There are ways to do this without substantially raising costs to upstream producers. Altogether, this would limit any unintended distortionary impact because the market signals would be clear enough for all constituencies to perceive and invest upon.

Question 2b. Other countries in Asia (China), Europe (Poland), and South America (Brazil and Argentina) are expected to develop shale gas reserves in the future. Do you think that this will dampen the low-cost advantage that the U.S. currently has for domestic exports right now? Is the federal government taking these new reserves into consideration when considering its permit approvals?

Answer. Development of supplies abroad certainly could dampen the current low-cost advantage the US enjoys today. However, this has largely been deemed a commercial consideration that is factored into the decision to file for an export license. If the resources abroad can be developed in a low-cost manner, then it is likely that US export terminals will sit largely unutilized, much like the recently constructed LNG import terminals in the US do today. But, the government has to weigh whether this is an issue better left classified as commercial risk. My understanding that this is indeed the case, as the DOE does not consider anything related to a forward-looking measure of profitability, other than what is reported in the license application, in its national interest calculation.

Question 2c. Has the federal government looked at whether there is enough natural gas to satisfy the diversity of demand? Are there regional differences in terms of export potential?

Answer. The government is currently commissioning a study aimed at just this. So, the answer here is that it is an ongoing endeavor. I think in the interest of constituency buy-in, it is important that the DOE seek external review of the study they commission, and that those reviews be held as anonymous until they are all collected. This could allow a truly unbiased assessment of the work that is done.

Regionally, there are likely differences regarding export potential. The Gulf Coast region, for example, has very developed pipeline and production infrastructure as well as port facilities, which makes exports relatively lower cost than say regions along the East and West Coasts. However, even along the East Coast there is heterogeneity in this regard. For example, feeding the Cove Point facility in Maryland with gas from the Marcellus shale—either directly or by displacement—would be a relatively easy thing to do because much of the necessary infrastructure is already in place.

Question 2d. What factors are weighed when considering the benefit of exporting a raw material (natural gas) or a finished product in the form of chemicals and higher valued goods?

Answer. These assessments are typically made by different commercial entities. However, in point of fact international trade theory suggests that the impact on domestic prices will similar. Theory suggests that if an activity is increased because

there are high returns to it, then the factors of production that are used most intensively will also see higher returns (see Heckscher-Ohlin, Stolper Samuelson, Rybczynski, etc.). Thus, if we export natural gas, the returns to gas producers will rise. If we export products that use natural gas intensively as an input, then the returns to natural gas will increase. In both cases, the returns to gas producers go up, although the magnitudes are likely different as in the latter case the income earned is split amongst a larger number of participants. However, neither of these considers cost, and the most efficient allocation of the domestic natural gas resource is one which also minimizes cost.

RESPONSES OF KENNETH B. MEDLOCK, III, TO QUESTIONS FROM SENATOR MURKOWSKI

Question 1. Growth in the global LNG trade will continue to create greater "interconnectedness" between previously disconnected markets. Mr. Medlock, can you please speak to the extent to which increasing energy supply diversity will help us to achieve our energy security goals?

Answer. Greater supply diversity, a goal achieved by making multiple supplies available at a competitive rate, contributes to broader goals of energy security in a major way. As new sources of energy supply are made available at competitive costs, it abates the demand for traditional sources of supply. To the extent new supplies are available from domestic sources rather than foreign sources, the potential costs associated with foreign-sourced disruptions in supply are reduced. In this way, energy security arguments used to justify expansion of renewable sources of energy such as wind and solar, also apply to natural gas. However, since we use very little oil in the power generation sector in the US, the option to displace oil by adopting renewables is limited unless further policies are used to encourage the adoption of electric vehicles. Natural gas is a lower cost option for enhancing energy security, and could in fact be used as a transitory bridge in transforming the transportation infrastructure and the power generation sector, which in turn would provide the energy security benefit often sought in conversations regarding a reduction in oil imports.

Question 2. Would it be safe to say that this interconnectedness will reduce price volatility as well as the risks associated with supply disruptions?

Answer. Yes. Increasing connectedness between markets provides arbitrage opportunities, and hence liquidity, that did not exist previously. This means that price imbalances across regions can be quickly eliminated. The global gas market has not yet reached this point, but the evolution has begun. In a paper written for the National Commission on Energy Policy and the American Clean Skies Foundation (attached for reference) I demonstrated that allowing trade does not increase volatility; rather, it reduces it. Moreover, concerns about a linkage to oil market volatility are misguided. Annualized oil price volatility over the last 30 years, except 2008, has been consistently lower than natural gas price volatility in the US. In fact, this is why many large consumers in Europe have been willing to purchase gas on an oil-indexed basis—because it ties the price to a commodity that is many times more liquid, more fungible, and historically less volatile.

Question 3. The tremendous growth that we have seen in our domestic natural gas resource will clearly have wide-ranging implications. Given the research that you have conducted on this subject at Rice, can you please explain to this committee the impact that these supplies will have on prices, market volatility and ultimately supply diversity?

Answer. First, it is important to distinguish between types of market volatility. Normal price fluctuations in the presence of changing demand and supply conditions in the short run are signals of a well-functioning market. The type of volatility that most major consumers are concerned about is actually an inaccuracy of price expectations over a given planning horizon (such as 5-10 years). If utilities and other major gas consumers are uncertain about the future price environment they will be less apt to invest heavily in gas-using infrastructure.

Development of abundant domestic resources that can supplied at relatively low cost can result in more stable prices, and as a result, encourage investment in energy-using infrastructure—such as those made by utilities—that favors the use of that resource. In effect, as the natural gas supply curve is made more elastic, fluctuations in long-term demands can be met with little change in market price. Thus, by providing a more stable environment, investments will be made that result in greater penetration of natural gas in the energy mix. This, in turn, moves the domestic energy use portfolio to one that is more heavily domestic-focused, and provides a diversification benefit.

Importantly, the current market structure that facilitates efficient arbitrage is also critical to this end as it provides the mechanism for the clear market signals needed to facilitate the aforementioned investment opportunities.

Question 4. It is a well-established principle that inventories generally reduce volatility—to what extent will reducing price volatility make it easier for businesses to make long term investment decisions?

Answer. See answer to question 3. It is well-established that price volatility, in the sense that it creates uncertainty about future prices, lowers investment activity. There is an option value to waiting when there is a high degree of uncertainty. Reducing uncertainty lowers the option value to waiting and makes firms more receptive to higher levels of investment.

Question 5. If high price volatility translates to reduced investment, increased unemployment, and lower output, is it likely that lowering price volatility will lead to increased investment, employment and economic output?

Answer. See answer to questions 3 and 4. Yes. The preponderance of economic literature indicates there is a positive benefit to lower uncertainty, but it is also inaccurate to say the scale of the benefits with low uncertainty are symmetric to the scale of the costs associated with higher uncertainty. The evidence indicates that there is a larger negative impact on investment with higher uncertainty than there is a positive impact from lower uncertainty. Again, it is important to recognize normal short term volatility is different than uncertainty about future market price. An extreme argument is one that stipulates price controls are the best mechanism to regulate high levels of investment. However, by masking the supply-demand signals that materialize through price, governments run the risk of massive, destabilizing unexpected shifts in price—Indonesian gasoline prices, for example.

Question 6. In the US, how do LNG, the domestic shale gas resource, and domestic storage interact? In particular, are regional impacts different than what is seen at the Henry Hub?

Answer. LNG in the US, with the exception of Alaska, has been a story of imports. There is evidence that LNG cargoes have been diverted to the US in low demand periods in Europe and Asia simply because there is little risk of market access and there is abundant storage capacity—so lots of liquidity. Thus, the US storage market has been used to arbitrage seasonal prices abroad in the absence of robust storage capacity in overseas markets, meaning LNG and storage certainly have interacted in the past.

The emergence of shale in the US has put additional stresses on the availability of storage capacity as domestic production growth has outpaced growth in demand. This has pushed prices down and left LNG imports at all-time lows. Notably, however, recent regulatory moves to make storage in the US follow market-based pricing have encouraged an increase in investment in storage capacity.

It is important to note that if demand were to increase, LNG import capacity actually provides a stabilizing effect on any upward price pressure that could emerge. By the same token, LNG exports could provide some price support from the low side. In total, with the capacity to both import and export the world could more effectively use the large storage capacity that exists in the US, and US prices would, as a result, remain in a range defined by the arbitrage opportunities represented by storage, imports and exports.

Regionally, these impacts will vary, and will be reflective of regional weather patterns, storage capability, pipeline capacity, and LNG terminal existence. For example, the New England market will likely remain reliant on LNG imports and pipeline supplies from the producing regions due to a lack of indigenous supply options and no real storage capacity. The Gulf Coast region will stand in stark contrast due to the ability to import, export, produce, and store natural gas due to massive infrastructures already in place and continued emergence of new opportunities.

Question 7. If there are any potential adverse impacts of a globalized gas trade and increased domestic LNG exports, in your opinion, are there policy options available to mitigate these impacts?

Answer. I see no real negative impacts under the status quo. The research I am involved in relies on scientific assessments and cost analysis based on existing data on well-performance indicates there is a large amount of resource available at a relatively stable range of prices between $5 and $6 per mcf. While this is above the current market price, movement into that range is likely sustainable for a long period of time. Not to mention three have been sustained improvements in productivity—which are verifiable through analysis of well file data available from the HPDI database from Drilling Info—that serve to lower breakeven prices over time, meaning the aforementioned range is likely conservative to the high side.

However, recent concerns about water contamination and localized air pollution associated with domestic drilling could result in the imposition of burdensome costs.

This, in the extreme case, could make domestic supply much more inelastic, which would push us into a period of higher price and higher price volatility. In other words, the largest real risk for adverse impacts may be policy itself.

This is not to say that costs of activities should not be internalized, because they should be if we truly seek a socially efficient outcome. But, it is important to identify means to force that internalization in the least costly way possible. This includes transparency in the regulatory framework with some lead time for operators to adjust. I have addressed the consequence of uncertainty for investment in the price dimension above, but policy uncertainty can be equally, if not more so, detrimental to investment activity. Therefore, the first rule of policy should be one of transparency and adequate adjustment leads for adoption of regulatory changes.

The actual policy options can be wide-ranging, but the appropriate action in some instances needs to be informed by scientific study. By some estimates, over 80% of all wells drilled involve fracture-stimulation techniques. Thus, regulations on this front extend beyond shale gas and shale oil. This needs to be considered. It is important that scientific assessment be expedited. Shale gas wells are being drilled by the thousands on an annual basis, and delaying release of the EPAs study to 2014 will make policy response increasingly difficult. By 2014, US shale gas production will account for over 35% of domestic production—in other words the ship is already sailing. It is also important that EPA regional offices do a full scientific assessment, a flaw that was exposed in its recent analysis of water wells on a ranch in the Barnett Shale region. These sorts of short cuts invalidate previous and subsequent analyses, a point I am sure policy-makers do not want to have to grapple with at length.

Question 8. Will exports from the United States necessarily make natural gas markets track with, or behave similarly to, oil markets?

Answer. No. In fact, exports from the US could increase international gas market liquidity and encourage further evolution in Europe and Asia toward hub based pricing. In other words, liquidity makes price discrimination more difficult, and to be sure, oil-indexation is a form of price discrimination. This point is discussed in a recent paper published by the Baker Institute and attached hereto—a DOE sponsored study titled "Shale Gas and US National Security." It is more likely that US LNG exports will help to push international gas market evolution to one that is better characterized by gas-on-gas pricing. In addition, exports from the US actually provide a link to a very large, liquid US gas market with more storage capacity than any other regional market in the world. This facilitates arbitrage and encourages consumers to seem gas market outlets for shedding price risk.

RESPONSES OF ANDREW SLAUGHTER TO QUESTIONS FROM SENATOR COONS

Question 1a. Domestic supplies of natural gas are increasing and market demand is growing. Additionally, natural gas has become a bridge fuel for achieving a more secure, lower carbon economy in several ways. For example, natural gas can help with renewable energy intermittency. The market is also driving conversion of vehicle fleets to natural gas, and increasingly, coal-fired plants are shifting to natural gas because of emissions requirements. Further, natural gas is and always will be very important to the manufacturing and chemical industry.

In your view, is the role of the federal government strategically focused enough from a policy perspective to oversee and encourage the use of natural gas in various, relevant domestic and international markets?

Answer. The growth of natural gas supply in the U.S. and the growth in its future potential have largely been achieved without explicit federal government policy support. In the US, onshore hydrocarbon development rights may be obtained from private landowners, states, or the federal government. On the market side, again up to this point, growth in natural gas demand has been the consequence of choices made by industrial and residential consumers and electric utilities, comparing fuel choice and investment choice on grounds of economic preference and reliability of supply. It could be argued that federal and state policy actions have served to restrict the opportunity available to natural gas by means of mandates and subsidies for various forms of renewable energy, particularly in the electric power sector. In general terms, we would favor federal government policies and strategies which enable natural gas to compete on equitable terms with other fuels and fuel supply chains, allowing consumers to make informed choices based on their economic preferences.

Question 1b. What considerations are made when considering the tradeoffs of exports vs. domestic use—among them reducing gas price volatility, determining the

balance of trade, creating jobs, counteracting geopolitical influences, producing higher valued domestic goods?

Answer. From the perspective of a company which is investing heavily in the natural gas value chain, we examine sets of opportunities to serve both the domestic U.S. market, in existing and emerging demand sectors, and the international market, via exports. From an overall supply perspective, the recent increases in natural gas resource assessments, coupled with the actual increases in domestic natural gas production in recent years, provide Shell with a high level of confidence that both domestic and export markets can be supplied with U.S. natural gas for the foreseeable future. Natural gas development for both domestic and international markets provides opportunity for direct and induced job growth, while exports also provide a positive balance of trade impact.

Question 2a. The U.S. is now the world's largest natural gas producer. We are fortunate to have an abundant supply of natural gas, and our manufacturing economy needs to continue to develop those resources. However, demands can outpace supply without careful consideration. Recent reports from the Energy Information Administration have estimated very modest demand growth for natural gas in the U.S. in the next few years. At the same time, the National Petroleum Council issued a recent report that concluded that the North American natural gas resource potential is so large that it can supply "even the highest demand scenario."

What should be the take away for policymakers in terms of utilizing natural gas for the transportation sector or export market without creating economic distortions for other consuming industries?

Answer. As a result of the large increases in moderate cost natural gas resources described in the recent National Petroleum Council study, Shell does not believe that consuming industries or other demand sectors will be in a position of competing for limited natural gas supplies.. In fact, the natural gas resource is indeed able to support production growth in line with likely increases in demand in existing and new market sectors. A risk to this outcome would be if there were to be some new policy-led restrictions on U.S. natural gas development, such that this country would need to become more reliant on natural gas imports. Both absolute prices and price volatility in the natural gas market have declined in the past three years, coincident with the emergence of shale gas, and it is likely that these conditions can be sustained into the foreseeable future.

Question 2b. Other countries in Asia (China), Europe (Poland), and South America (Brazil and Argentina) are expected to develop shale gas reserves in the future. Do you think that this will dampen the low-cost advantage that the U.S. currently has for domestic exports right now? Is the federal government taking these new reserves into consideration when considering its permit approvals?

Answer. There are indeed shale gas resources distributed widely around the world, in the countries mentioned and in many others. The U.S. has a favorable context for more rapid development to scale of these resources because of its system of mineral rights, its well-developed service sector and supply chain, its successful track record in development and rapid deployment of appropriate technology, its large number of drilling companies, and its tax/royalty fiscal regime. These advantages are not easily replicable in other jurisdictions, so it is probable that shale gas will develop more slowly outside the U.S. Having said that, the market for natural gas globally is expected to grow faster than for most other fuels, expanding the opportunity for all sources of natural gas. We do not know if, and to what extent, the federal government is taking into account potential global gas supplies in determining export permit approvals, but would submit that the investors in these projects are well suited to assessing the commercial risks and opportunities.

Question 2c. Has the federal government looked at whether there is enough natural gas to satisfy the diversity of demand? Are there regional differences in terms of export potential?

Answer. Department of Energy representatives have stated that they have commissioned two new studies on the potential impact of exports on the domestic market. Shell will be happy to review and comment on these studies when they are available in early 2012. In terms of regional differences in export potential, North America is a well-integrated market with a well-connected high-capacity pipeline system, so there should be no discernible regional differences from a supply perspective. However, from an investment perspective, those regions with existing sites for liquid natural gas ("LNG") import and regasification have an advantage in that they will benefit from lower investment requirements, with such facilities as jetties and LNG tanks already in place. Although new investments in liquefaction trains will be substantial, the overall costs will be significantly less than for a completely new facility on a greenfield site. For the same reasons, construction and operating per-

mits will also likely to be more straightforward to obtain at sites previously permitted for LNG imports. Most existing import sites are on the U.S. Gulf Coast.

Question 2d. What factors are weighed when considering the benefit of exporting a raw material (natural gas) or a finished product in the form of chemicals and higher valued goods?

Answer. As stated in the responses to 1b and 2a above, Shell believes that competitive and reliable natural gas supply can be obtained for the foreseeable future to serve LNG exports and an expanded U.S. chemical industry. The trade-offs implied in the question are unlikely to be a real factor in commercially-driven investment decisions.

RESPONSES OF ANDREW SLAUGHTER TO QUESTIONS FROM SENATOR MURKOWSKI

Question 1. I see that Shell is investing to monetize our domestic natural gas resources in a variety of different ways. It is especially heartening to see that you are simultaneously pursuing investments in both LNG export as well as a new gas to chemicals facility in the Marcellus. Is it safe to say that you believe that there are sufficient domestic natural gas supplies to support both of these activities and do so profitably?

Answer. The evidence reported in the recent National Petroleum Council study, as well as from a wide variety of public sources and from a private, confidential survey of industry participants, provided Shell with a high level of confidence in the long-term sustainability of growing U.S. natural gas supply at moderate cost. While Shell has not made any final investment decision regarding an LNG export facility or a gas chemical facility, the confidence we have in long-term growth of the US natural gas supply is now being manifested in Shell's serious consideration very significant (multi-billion dollar) investment opportunities in upstream natural gas development in the US and in expanding uses for U.S. natural gas in several sectors. Shell believes that sufficient competitive domestic natural gas supplies will be available to support these and other opportunities to grow the U.S. natural gas market and open up opportunities for LNG export.

Question 2. Your testimony indicates that there's room for many, many options insofar as the US making use of its gas resources. Can you talk about how geography plays into this? Obviously, a chemical plant in West Virginia is sited according to where the resource lies, but what about a more distant place like Alaska without as many options for value added, and without as much proximity to markets?

Answer. Alaska has world-class oil and natural gas resources, and Shell is actively preparing to begin a new round of offshore exploration which can make a major contribution to realizing Alaska's long-term potential as a world-scale oil and gas producer for decades to come. The development of Alaska's natural gas has faced unique challenges stemming from the scale, complexity and cost of building the infrastructure needed to connect Alaskan natural gas with other North American markets. However, we note that Alaska has a long-standing history of exporting LNG to Asia, although on a relatively small-scale. Because of expected growth in Asian gas demand, and Alaska's relative proximity to the large Asian LNG markets, it may be that the development of world-scale LNG liquefaction and export facilities could provide an earlier opportunity to significantly increase Alaskan natural gas production, and provide at least some of the anchor infrastructure which will ultimately be needed to connect Alaskan gas to the main North American market.

Question 3. Does LNG export make much more sense from some locations within the US than others, even though the gas is ultimately a national resource?

Answer. As stated in the response to Senator Coons' question 2c above, in terms of regional differences in export potential, North America is a well-integrated market with a well-connected high-capacity pipeline system, so there should be no discernible regional differences from a supply perspective. However, from an investment perspective, those regions with existing sites for LNG import and regasification have an advantage in that they will benefit from lower investment requirements, with such facilities as jetties and LNG tanks already in place. Although new investments in liquefaction trains will be substantial, the overall costs will be significantly less than for a completely new facility on a greenfield site. For the same reasons, construction and operating permits will also likely to be more straightforward to obtain at sites previously permitted for LNG imports. Most existing import sites are on the U.S. Gulf Coast.

Question 4. The emergence of shale gas has significant implications for the global gas trade. Will you outline potential impacts of North American LNG exports on domestic natural gas price volatility, to the extent your firm has analyzed this?

Answer. The emergence of a geographically diverse and moderate cost U.S. natural gas supply allows natural gas production to grow incrementally in line with demand growth. A higher rate of demand growth, including new demand from LNG exports, will result in a higher rate of supply growth, and vice versa. This is because shale gas development occurs via drilling of multiple wells across multiple geographical basins, and is not dependent on a small number of highly capital intensive facilities and pipelines, as would occur for offshore gas development, for example. As such, the pace of development is responsive in the very short term to market signals to either accelerate or slow down the pace of development. This increased supply elasticity is a major contributor to lower natural gas price volatility than in the past. Short-run weather-related volatility should also decline in some circumstances, for example with a more diversified onshore gas production portfolio, the price spikes resulting from hurricane-related interruptions of offshore supply, as occurred in 2005 and 2008, are expected to have a much lower impact.

Question 5. Given the relatively long timeframes within which LNG cargoes can be contracted—10 or 20 years—is there great risk that the volumes necessary to meet contract obligations might not be available at any point within that timeline?

Answer. The evidence presented in the National Petroleum Council study indicates that reliable, competitive supply should be available from the U.S. for many decades to come. Commercial entities which enter into LNG export agreements will do so on the basis that they understand the natural gas supply outlook and that they are willing to bear any associated commercial risk. By executing such agreements these entities will be expressing their confidence that sufficient competitive and reliable natural gas supply will be available for the duration of their contracts.

RESPONSES OF JIM COLLINS TO QUESTIONS FROM SENATOR COONS

Question 1a. Domestic supplies of natural gas are increasing and market demand is growing. Additionally, natural gas has become a bridge fuel for achieving a more secure, lower carbon economy in several ways. For example, natural gas can help with renewable energy intermittency. The market is also driving conversion of vehicle fleets to natural gas, and increasingly, coal-fired plants are shifting to natural gas because of emissions requirements. Further, natural gas is and always will be very important to the manufacturing and chemical industry.

In your view, is the role of the federal government strategically focused enough from a policy perspective to oversee and encourage the use of natural gas in various, relevant domestic and international markets?

Answer. The short answer is no. The longer answer is that long-term planning, which is essential to a "strategically focused" federal government, appears not to be a priority of the U.S. Congress. While APGA believes that the wise development and use of natural gas should be a key component of an overall energy policy that has as its centerpiece the pursuit of energy independence, is there any real prospect in the near-term of Congress adopting a coherent energy policy? APGA is not by nature cynical, but is mindful that this Nation has had a policy goal of energy independence since the 1970s, a policy that has been articulated by each White House occupant since that time, and never seriously pursued.

In lieu of a comprehensive energy policy, Congress has constructed primarily a patchwork of short-term tax policies to incentivize some aspect of natural gas production or use. For example, over the past several years, the Congress has offered several valuable, short-term tax credits for natural gas vehicles (NGVs) and refueling infrastructure. Though helpful in temporarily advancing NGVs, which are a key component of weaning this Nation off of imported oil, the fact that such credits are typically in place for short durations creates a boom and bust cycle that leaves businesses unable to make significant investments over the long-term.

The Energy Policy Act of 2005 created two tax credits: Alternative Fuel Vehicles and Alternative Fuel Infrastructure, which provided consumers with incentives for the purchase of alternative fueled vehicles and the installation of refueling infrastructure. The Alternative Fuel Vehicle credit expired in 2010 and the Alternative Fuel Infrastructure credit is scheduled to expire in 2012.

If the United States had a long-term energy independence strategy, these credits, which are essential to industry's ability to make long-term investments, would not be allowed to expire. In short, sound investment decisions can only be made by businesses with a clear understanding of the costs and benefits over the long-term.

Another example of the inability of Congress to act coherently in the pursuit of energy independence is the plight of the New Alternative to Give Americans Solutions Act (NAT GAS Act). This bipartisan proposal introduced by Representatives Sullivan (R-OK), Boren (D-OK), Larson (D-CT), and Brady (R-TX) targets the re-

placement of the heavy-duty vehicle fleet by offering short-term tax credits (for five years) for alternative fuel infrastructure installation, alternative fuel vehicle purchases, and alternative fuel credits, as well as other incentives. According to the bill's sponsors, this legislation has the potential to create 500,000 new jobs over the life of the legislation. It is important to note that this short-term legislation targets only one subsector of one application of natural gas in the United States. The fact that this legislation could create half a million jobs in just one subsector in the short-term, is indicative of the broad job creation potential of all applications of natural gas from vehicles to generation. Moreover, this legislation elucidates the fact that a long-term commitment to NGVs as a part of a comprehensive energy policy and generation as a part of a comprehensive energy policy has enormous, durable job creation potential which dwarfs even the most optimistic of pro-export job assessments. Tragically, this common sense, bipartisan legislation to reduce our dependence on foreign oil has been stymied.

Moreover, our lack of a national energy policy is also illustrated on the supply side. The history of offshore drilling is well known—and nymbyism (Not in My Backyard) has meant that huge, readily accessible oil and natural gas reserves have been left in the ground. As for shale gas, the approach to determining the safest, most efficient means of conducting the fracturing that is the key to unlocking the shale gas reserves is totally disjointed, with states and various agencies of the federal government doing studies, reviews, analyses, etc., with coordination apparently being the furthest thing from anyone's mind.

Given the absence of a coherent national energy policy, APGA is deeply concerned that the Department of Energy would authorize LNG exports in large quantities of a commodity, natural gas, the domestic supply of which is uncertain (due to the well-publicized "fracking" issue) and whose value in achieving energy independence is incalculable. The first step of a coherent energy policy is a fact-based determination regarding the extent of this valuable commodity that that can be produced over the long-term and the manner in which this Nation can use that commodity in lieu of imported oil. APGA believes that a decision on exporting natural gas be made in the absence of such determinations is shortsighted.

APGA similarly asserts that Congress is not yet sufficiently focused from a policy perspective to oversee international markets for natural gas. Though basic metrics about foreign natural gas markets such as price and volumes of natural gas are readily available and well known to the Department of Energy (DOE), Congress, and those in favor of export, what is not well known is the cumulative price impact of large-scale export of liquefied natural gas from the U.S. to international markets.

As Mr. Chris Smith, Deputy Assistant Secretary for Oil & Natural Gas, Office of Fossil Energy, DOE, testified during the hearing, two studies have been commissioned by the DOE to examine this question: one by the Energy Information Administration (EIA) and one by an independent contractor. These studies may provide Congress with a clear picture of what impacts its current unrestrained pro-export policies are already having on U.S. consumers and businesses.

APGA asserts that to continue to allow a veritable "export highway" of domestic natural gas to be established, thereby preempting ongoing government studies, is as predictable as it is disastrous—we will experience price increases and the price volatility of the past will return, and our opportunity to displace foreign oil will be wasted—all for the short-term profits of a few.

The more prudent course is to limit exports in accordance with all trade agreements until the conclusions of such studies are known and Congress can make an informed decision based on upon unbiased, reliable information.

Question 1b. What considerations are made when considering the tradeoffs of exports vs. domestic use—among them reducing gas price volatility, determining the balance of trade, creating jobs, counteracting geopolitical influences, producing higher valued domestic goods?

Answer. APGA believes that the overriding consideration should be the pursuit of energy independence, given the huge (and highly unfortunate) role that our Nation's dependence on foreign oil has had in dictating foreign and domestic policy. Further, APGA believes that exporting natural gas will by definition increase the domestic price of natural gas, increase price volatility, be less helpful to our balance of trade than a well-functioning U.S. economy that is not dependent on foreign oil, and create fewer jobs than a vibrant U.S. economy in which natural gas plays a major role in displacing imported foreign oil in the transportation sector. And these are just a few of the advantages to this Nation of importing less foreign oil because of our ability to rely on natural gas as a substitute fuel. Needless to say, exporting natural gas in substantial quantities is antithetical to achieving these important goals.

Question 2a. The U.S. is now the world's largest natural gas producer. We are fortunate to have an abundant supply of natural gas, and our manufacturing economy needs to continue to develop those resources. However, demands can outpace supply without careful consideration. Recent reports from the Energy Information Administration have estimated very modest demand growth for natural gas in the U.S. in the next few years. At the same time, the National Petroleum Council issued a recent report that concluded that the North American natural gas resource potential is so large that it can supply "even the highest demand scenario."

What should be the take away for policymakers in terms of utilizing natural gas for the transportation sector or export market without creating economic distortions for other consuming industries?

Answer. APGA respectfully submits that the primary take away for policymakers in terms of utilizing natural gas for the transportation sector or export market without creating economic distortions for other consuming industries is the fact that export of domestically-produced natural gas will inevitably create the very economic distortions for all domestic natural gas consuming industries that Congress seeks to prevent.

Currently, the general demands on natural gas are: electric generation, industrial processes, direct use and NGVs. Assuming questions about hydraulic fracturing policy and resource estimates are satisfactorily answered, the current natural gas resource supply appears to be adequate to meet the growing needs of the aforementioned sectors, now and in the foreseeable future. Even projecting robust growth in demand in all sectors, the U.S. shale gas resources seem capable of providing low-cost natural gas for use by all areas.

However, if Congress allows the large-scale export of natural gas to occur, the addition of world demand for relatively inexpensive U.S. natural gas on top of current domestic demand seems highly likely to cause significant economic distortions in the form of artificially increased prices for natural gas for all sectors of the U.S. natural gas industry. Moreover, the fact that large-scale export of natural gas will inevitably link the U.S. market with international markets that are substantially more volatile and less transparent will also reverse the current trend of price stability in the domestic natural gas market.

APGA believes that the best means of protecting all natural gas-consuming U.S. industries is to encourage domestic use of natural gas and to limit exports to the extent possible under current trade agreements. Such a policy might also be a blessing in disguise to those now seeking to spend billions of dollars to export natural gas as the world supply of shale gas is vast and thus the arbitrage opportunities that exist today are sure to diminish substantially over a relatively short period of time.

Moreover, APGA also believes that should Congress choose to continue to allow export of domestically-produced natural gas, the application process should be altered to more accurately reflect the public interest. When applications are filed at DOE, there is a public interest test that must be met—but not by the applicants. In cases where the application is specific to identified countries with which the U.S. has a free trade agreement, the application is deemed to be consistent with the public interest and granted without modification or delay. In cases where an application is seeking exportation of LNG to countries with which the U.S. does not have free trade agreements, the burden is on those opposed to the application to demonstrate that the application is not consistent with the public interest. The structure of this process under which opponents of an export must prove a negative is counter-intuitive on its face and makes it extremely difficult, if not impossible, for opponents to defeat an application for the export of LNG. APGA supports the passage of legislation that places the burden of proof where it should be, on the applicant to demonstrate to DOE how the approval of that application is in the public interest.

Question 2b. Other countries in Asia (China), Europe (Poland), and South America (Brazil and Argentina) are expected to develop shale gas reserves in the future. Do you think that this will dampen the low-cost advantage that the U.S. currently has for domestic exports right now? Is the federal government taking these new reserves into consideration when considering its permit approvals?

Answer. APGA believes that the exportation of advanced drilling technologies to other countries such as China, Poland, Brazil and Argentina will ultimately dampen the low-cost advantage that the U.S. has for exports of domestic natural gas. Shale gas formations are not unique to the United States—this is not a U.S. phenomenon; it is a world-wide phenomenon.[1] The State Department launched the Global Shale

[1] E.g., "Shale Gas: Global Game Changer," by Dallas Parker, Oil and Gas Financial Journal (Feb. 8, 2011), http://www.ogfj.com/index/article-tools-template/ printArticle/articles/oil-gas-financial-journal/unconventional/shale-gas global.html; "Worldwide Gas Shales and Unconven-

Gas Initiative ("GSGI") in April 2010 in order to help countries identify and develop their unconventional natural gas resources.[2] To date, partnerships under GSGI have been announced with China, Jordan, India, and Poland.[3] The big energy players, including ExxonMobil, Chevron, Shell, BP, etc. are spending billions world-wide to pursue shale gas plays.[4] The point to be made, of course, is that the United States, which is at the forefront technologically of the development of shale gas reserves, should be exporting its technology and expertise—not spending billions of dollars to build facilities in order to export a commodity that can play such a vital role in contributing to our national well-being and that also may be abundant world-wide before the LNG export facilities can even be completed.

Question 2c. Has the federal government looked at whether there is enough natural gas to satisfy the diversity of demand? Are there regional differences in terms of export potential?

Answer. APGA is aware that the federal government has partially examined the question of the adequacy of natural gas supply to meet the diversity of demand. In its Annual Energy Outlook 2011, the EIA modeled four natural gas resource assessment scenarios and included price projections with the primary assumption of a continuation of current law: two high resource scenarios and two low resource scenarios. This assumption is critical as it signifies that advanced drilling techniques and hydraulic fracturing remain primarily state regulated. Significant uncertainty surrounding the future of hydraulic fracturing and therefore access to shale gas resources exists due to the EPA's pending study on fracking and the potential for Congressional action based upon the EPA study. In short, should access to shale gas resources be restricted by the Federal Government or the states, EIA's analysis would be rendered moot.

Moreover, it is important to note that EIA included this qualification of its own modeling on pages 37-38, AEO 2011,

> There is also considerable uncertainty about the ultimate size of the technically and economically recoverable shale gas resource base in the onshore lower 48 States and about the amount of gas that can be recovered per well, on average, over the full extent of a shale formation. Uncertainties associated with shale gas formations include, but are not limited to, the following:
>
> • Most shale gas wells are only a few years old, and their long-term productivity is untested. Consequently, reliable data on long-term production profiles and ultimate gas recovery rates for shale gas wells are lacking.
>
> • In emerging shale formations, gas production has been confined largely to "sweet spots" that have the highest known production rates for the formation. When the production rates for the sweet spot are used to infer the productive potential of an entire formation, its resource potential may be overestimated.
>
> • Many shale formations (particularly, the Marcellus shale) are so large that only a portion of the formation has been extensively production tested.
>
> • Technical advances can lead to more productive and less costly well drilling and completion.

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tional Gas: A Status Report," Vello A. Kuuskra and Scott A. Stevens ("The final segment of this "paradigm shift"—the worldwide pursuit of gas shales and unconventional gas—has only just begun, with Australia, China and Europe in the lead. Europe's gas shale geology is challenging, but its resource endowment and potential are large.") http://www.rpsea.org/attachments/articles/239/KuuskraaHandoutPaperExpandedPresentWorldwideGasShalesPresentation.pdf. Debajyoti Chakraborty, Asia's First Shale Gas Pool Found Near Durgapur, Times of India Online, (January 26, 2011); Hillary Heuler, Shale Gas in Poland Sparks Hope of Wealth, Energy Security, Voice of America Online (June 11, 2011) (Reporting on efforts by U.S. and other western gas companies to develop gas from shale deposits). "The Shale Gas Run Spreads Worldwide," by Mark Summor IPS, Deccan Herald (Aug. 1, 2011)(" Recent discoveries of deeply buried oil shale layers containing natural gas or oil are being reported in Australia, Canada, Venezuela, Russia, Ukraine, Poland, France, India, China, North Africa and the Middle East. Taken together, say some energy analysts, these 'plays' could become a game-changer, making Australia and Canada into new Saudi Arabias.").

[2] See http://www.state.gov/s/ciea/gsgi/

[3] Id. see also, Rakteem Katakey, India Signs Accord with US to Assess Shale-Gas Reserves, Bloomberg News (November 8, 2010) (The US signed a memorandum of understanding with India to help it asses its shale gas reserves and prepare for its first shale gas auction at the end of this year.); Kate Andersen Brower and Catherine Dodge, Obama Says US, Poland Will Cooperate on Economy, Energy, Bloomberg News (May 28, 2011) (Reporting on President Obama's pledge to share U.S. shale gas extraction expertise and technology on a recent trip to Warsaw); see also, Energy in Poland: Fracking Heaven, The Economist (June 23, 2011).

[4] "Big Oil Betting on Shale Gas," by Ken Silverstein, EnergyBiz (July 31, 2011)

APGA respectfully asserts that if this type of uncertainty regarding shale gas resources exists at the federal government's top repository of energy data and analysis, then Congress should halt any export of natural gas resources until a more definitive, unbiased assessment of the resource base is complete and a long-term national energy strategy based on that assessment is developed.

As to the question regarding regional differences in terms of export potential, APGA believes that this is a national issue that must be addressed from the standpoint of a national policy on production and use of natural gas in such a fashion as to responsibly further a national policy of energy independence.

Question 2d. What factors are weighed when considering the benefit of exporting a raw material (natural gas) or a finished product in the form of chemicals and higher valued goods?

Answer. Given what appear to be the obvious downsides of exporting natural gas (in terms of raising domestic prices, undermining price stability, and ultimately undermining America's ability to wean itself off of foreign oil), the answer, in APGA's view, is a no-brainer. Natural gas used domestically in the production of chemicals and higher valued goods will not only be good for America in terms of jobs and trade balances, but will further, rather than undermine, our hoped-for march toward energy independence. While there are undoubtedly other factors to consider, and APGA defers to experts in the field as to these other factors, APGA submits that none of these factors outweighs the need for America to adopt and pursue a policy of energy independence—a policy that demands that we produce and use natural gas domestically in an efficient fashion.

APPENDIX II

Additional Material Submitted for the Record

November 3, 2011.

SHALE GAS REVOLUTION

By David Brooks.

The United States is a country that has received many blessings, and once upon a time you could assume that Americans would come together to take advantage of them. But you can no longer make that assumption. The country is more divided and more clogged by special interests. Now we groan to absorb even the most wondrous gifts.

A few years ago, a business genius named George P. Mitchell helped offer such a gift. As Daniel Yergin writes in "The Quest," his gripping history of energy innovation, Mitchell fought through waves of skepticism and opposition to extract natural gas from shale. The method he and his team used to release the trapped gas, called fracking, has paid off in the most immense way. In 2000, shale gas represented just 1 percent of American natural gas supplies. Today, it is 30 percent and rising.

John Rowe, the chief executive of the utility Exelon, which derives almost all its power from nuclear plants, says that shale gas is one of the most important energy revolutions of his lifetime. It's a cliché word, Yergin told me, but the fracking innovation is game-changing. It transforms the energy marketplace.

The U.S. now seems to possess a 100-year supply of natural gas, which is the cleanest of the fossil fuels. This cleaner, cheaper energy source is already replacing dirtier coal-fired plants. It could serve as the ideal bridge, Amy Jaffe of Rice University says, until renewable sources like wind and solar mature.

Already shale gas has produced more than half a million new jobs, not only in traditional areas like Texas but also in economically wounded places like western Pennsylvania and, soon, Ohio. If current trends continue, there are hundreds of thousands of new jobs to come.

Chemical companies rely heavily on natural gas, and the abundance of this new source has induced companies like Dow Chemical to invest in the U.S. rather than abroad. The French company Vallourec is building a $650 million plant in Youngstown, Ohio, to make steel tubes for the wells. States like Pennsylvania, Ohio and New York will reap billions in additional revenue. Consumers also benefit. Today, natural gas prices are less than half of what they were three years ago, lowering electricity prices. Meanwhile, America is less reliant on foreign suppliers.

All of this is tremendously good news, but, of course, nothing is that simple. The U.S. is polarized between "drill, baby, drill" conservatives, who seem suspicious of most regulation, and some environmentalists, who seem to regard fossil fuels as morally corrupt and imagine we can switch to wind and solar overnight.

The shale gas revolution challenges the coal industry, renders new nuclear plants uneconomic and changes the economics for the renewable energy companies, which are now much further from viability. So forces have gathered against shale gas, with predictable results.

The clashes between the industry and the environmentalists are now becoming brutal and totalistic, dehumanizing each side. Not-in-my-backyard activists are organizing to prevent exploration. Environmentalists and their publicists wax apocalyptic.

Like every energy source, fracking has its dangers. The process involves injecting large amounts of water and chemicals deep underground. If done right, this should not contaminate freshwater supplies, but rogue companies have screwed up and there have been instances of contamination.

The wells, which are sometimes beneath residential areas, are serviced by big trucks that damage the roads and alter the atmosphere in neighborhoods. A few sloppy companies could discredit the whole sector.

These problems are real, but not insurmountable. An exhaustive study from the Massachusetts Institute of Technology concluded, "With 20,000 shale wells drilled in the last 10 years, the environmental record of shale-gas development is for the most part a good one." In other words, the inherent risks can be managed if there is a reasonable regulatory regime, and if the general public has a balanced and realistic sense of the costs and benefits.

This kind of balance is exactly what our political system doesn't deliver. So far, the Obama administration has done a good job of trying to promote fracking while investigating the downsides. But the general public seems to be largely uninterested in the breakthrough (even though it could have a major impact on the 21st-century economy). The discussion is dominated by vested interests and the extremes. It's becoming another weapon in the political wars, with Republicans swinging behind fracking and Democrats being pressured to come out against. Especially in the Northeast, the gas companies are demonized as Satan in corporate form.

A few weeks ago, I sat around with John Rowe, one of the most trusted people in the energy business, and listened to him talk enthusiastically about this windfall. He has no vested interest in this; indeed, his company might be hurt. But he knows how much shale gas could mean to America. It would be a crime if we squandered this blessing.

THE WALL STREET JOURNAL, OCTOBER 27, 2011

BG, CHENIERE FORGE GAS-EXPORT PACT

By Daniel Gilbert and Guy Chazan.

HOUSTON—The U.S. moved a step closer to becoming a major exporter of natural gas Wednesday as British energy company BG Group PLC agreed to buy liquefied natural gas from a facility on the Gulf Coast to supply Asian and European markets.

The deal to buy the liquefied gas from Cheniere Energy Partners LP, the first of its kind in the U.S., calls for BG to pay Cheniere about $8.2 billion over 20 years. It underscores how quickly the shale-gas boom has transformed the U.S. energy landscape, as surging domestic production is prompting companies that built facilities to import natural gas to reverse course and use them to export the resource instead.

The contract "is the first step towards the U.S. becoming a large-scale LNG exporter," said Frank Harris, head of liquefied natural gas, or LNG, at energy consultancy Wood Mackenzie.

The deal is a coup for Houston-based Cheniere as it seeks contracts for its liquefied gas, which will be super-cooled for export in ocean-going tankers, before beginning construction of a $6 billion facility in Cameron Parish, La., next year. It expects to begin exporting the gas in 2015.

It is also significant for BG, which will buy gas comparatively cheaply and sell it for much higher prices in Europe and Asia. "This gives us first mover advantage, and allows us to steal a march on our rivals," BG spokesman Neil Burrows said.

Energy companies in the U.S., Canada and Australia are planning or have already begun building more than a dozen projects to liquefy and export natural gas as they seek to capitalize on growing demand for liquid-gas imports. Asia is the hottest market: its demand for liquefied gas is expected to grow 68% between 2010 and 2020, according to advisory firm Poten & Partners.

BG, formerly one of the largest importers of LNG into the U.S., is now seeking permits to convert a facility in Lake Charles, La., to export gas. Freeport LNG Development LP has teamed with Macquarie Group to export LNG from a Texas facility.

In Canada, Apache Corp., Encana Corp. and EOG Resources Inc. earlier this month received approval from Canadian regulators to export LNG from a facility in British Columbia. And Royal Dutch Shell PLC last week said it acquired a site in British Columbia to potentially export LNG. Charif Souki, Cheniere's chairman and chief executive, said he is confident that the "enormous market" for LNG will more than accommodate the new supply. He said the company expects to strike a deal that will lock in most of the LNG capacity not yet under contract from its facility in the next few weeks.

INDUSTRIAL ENERGY CONSUMERS OF AMERICA,
Washington, DC, November 22, 2011.

Hon. JEFF BINGAMAN,
Chairman, Committee on Energy and Natural Resources, 304 Dirksen Office Building, Washington, DC.

Hon. LISA MURKOWSKI,
Ranking Member, Committee on Energy and Natural Resources, 304 Dirksen Office Building, Washington, DC.

DEAR CHAIRMAN BINGAMAN AND RANKING MEMBER MURKOWSKI:

Thank you for having the hearing on the "approval process and potential for liquefied natural gas exports" on November 8, 2011. We offer the following comments for the record.

As substantial industrial consumers of natural gas and natural gas fired electricity, we are not opposed to natural gas exports but we do have concerns regarding the approval process for permitting of waterborne exports of natural gas. The hearing is especially timely because six export applications have been filed and many more are anticipated.

Natural gas availability and price is a public health, safety, jobs and economic matter. Unlike other traded products, natural gas exports have the potential to impact every citizen of the country. Manufacturing competitiveness, energy independence and security is an issue. Consuming domestically produced natural gas to make value-added products here and ship them offshore is a better alternative for manufacturers and the country.

It is also important to note that while natural gas prices have been fairly flat for the last couple of years, the Chicago Mercantile Exchange price of natural gas eight years from now is selling for over 84 percent above today's price (see chart in appendix), substantially above EIA Energy Outlook price forecasts. In other words, the market is changing quickly and it is very important for Congress to ensure that the interest of the public is served within the process of considering approval of export requests.

The Natural Gas Act provisions that guide natural gas export applications were written at a time when our domestic natural gas supply was in question and accelerating LNG imports was the priority. We know, because IECA was strongly in support of LNG imports. The Natural Gas Act of 1938 never anticipated that the U.S. would potentially export natural gas. For all of the above reasons, it is very timely for the Congress to review existing law and make important changes that are common sense and truly protect the interest of the public.

1. Congress needs to re-evaluate the process of reviewing natural gas export applications

The Natural Gas Act assumes that exporting natural gas is in the "interest of the public." Doing so sets up a "rubber-stamp" approval process for shipments to free-trade agreement countries and does not have adequate checks and balances. Approving applications to export natural gas for a 20-year period of time has potentially significant long term implications for the U.S. consumer and needs to be carefully done, with transparency and a lot of careful study. In our view, careful evaluation is not happening.

Exporting natural gas, the equivalent of increasing demand, increases the relative price of natural gas and electricity. Exporting natural gas will result in higher costs to heat and cool homes, run factories and produce electricity than what it would cost without natural gas exports.

Congress should change the Natural Gas Act to not assume that exporting is in the interest of the public as an underpinning assumption. Each export application needs to be evaluated straight-up on its merits and with up to date market forecast data.

Examples that undermine the assumption that exporting natural gas is in the interest of the public are too numerous to list. We offer two examples below.

a) The study provided by Sabine Pass LNG Terminal to DOE to support their application said that exports from their terminal would increase the price of natural gas by 10.6 percent by 2015. A 10.6 percent increase to residential consumers would increase their annual cost about $5.9 billion. Higher natural gas prices will also increase electricity prices. Both reduce manufacturing competitiveness. How could higher natural gas and electricity prices be in the interest of the public? Since then, five other applications have been received. According to DOE data, these terminals would increase demand by about 14 percent and several other companies are preparing their applications. Considering that U.S.

demand has only increased by 3.4 percent since 2000, these terminals represent a substantial increase in demand that will surely raise natural gas prices well above the 10.6 percent estimate by the Sabine Pass application.

b) Taxpayers will spend about $4.5 billion of scarce federal dollars to fund LIHEAP to lower the cost of energy to families. Given the above mentioned price increases, exporting is inconsistent and in conflict the public policy that funds LIHEAP.

2. Upon receiving an export request to ship to a free trade agreement (FTA) country, the DOE is not required to make the public aware of the request. There will be no announcement of the request in the Federal Register or opportunity for the public to comment

Transparency is needed. The public should be informed and should be given the opportunity to file comments.

3. The process wrongfully relies heavily upon studies provided by the export applicant to justify approval

When the DOE receives an application to export, it also receives a study that justifies the approval of the application. There is absolute certainty that the study is going to say that exporting is in the interest of the public. The DOE should not rely upon the applicant's study in determining whether the application is in the public interest.

4. No study is done by the DOE to ensure that the interest of the public is served

One apparent problem is that the DOE does not do any study of its own that would consider real time changes in the supply and demand picture as it evaluates the application. And, simply looking at EIA forecasts are not a solution either because EIA forecasts do not include recently approved export terminals and pending EPA regulations on the electric generation industry and the industrial sector that will substantially increase demand.

The Natural Gas Act needs changed to require the DOE to complete a study for each application. The Natural Gas Act designates the DOE as the protector of the public interest. There is an assumption that exporting is in the interest of the public yet there is no DOE study to ensure that approval actually is in the "interest of the public." The study needs to take into consideration a 20-year look at supply, demand and price and consider, for example, an estimate of natural gas demand that will occur as a result of recently approved export terminals and pending EPA regulations on the electric generation industry and the industrial sector.

5. The export approval process does not give adequate time for intervening parties to develop their own study for consideration by the DOE for Non-Free Trade applications

The DOE relies upon independent third parties to intervene either for or against the applicant. If a party wishes to oppose the terminal, they will need to provide a study that makes the case—and there is insufficient time to do so. The studies that the DOE would consider by an intervener would be similar in scope to the studies filed by the export applicant. It takes several months to develop and implement such studies and puts interveners at a significant disadvantage. IECA recommends that interveners be given six months to provide a study.

6. The EIA data is used as a reference point for supply, demand and price by both the DOE and the export applicant do not include significant pending natural gas demand from EPA regulations or exports that are already approved

For example, page 9 of the Sabine Pass application cites the EIA Annual Energy Outlook 2010 "which estimates that annual domestic demand will grow only 0.2 percent to reach 24.86 Tcf in 2035." The problem is that EIA Outlook forecasts do not include the increases in natural gas demand that will occur as a result of pending natural gas export applications nor pending EPA regulations on the electric utility or industrial sector that will result in substantial increases in demand. Using the EIA forecast under-estimates forward demand and price. IECA recommends that DOE be required to have the EIA run a new demand/price scenario for each application that incorporates already approved export terminals and pending EPA regulatory impacts.

7. The application process does not consider the long term implication of U.S. prices potentially being set by international demand—just as it is with crude oil

With each export terminal approval, we move closer to the reality that U.S. natural gas prices will eventually be priced by international demand—just as crude oil is today. Right now, U.S. consumers are insulated from global demand and their

prices are lower because of it. IECA recommends that this scenario needs to be included with each application because each application takes us another step closer to global pricing. Pricing U.S. natural gas at international levels would almost triple the price and increase electricity prices.

8. Export permit approvals should include consumer safe guards

The Natural Gas Act says that exporting natural gas is in the interest of the public but does not require sufficient actions and safe guards to ensure that the public interests are served over the 20-year period of time. All approvals should have consumer protections. In that way, the interest of the public will be served over the 20 year period covered by the export terminals.

Thank you for having the hearing and we look forward to further discussions on this important topic.

Sincerely,

PAUL CICIO,
President.

November 4, 2011.

Hon. JEFF BINGAMAN,
Chairman, Committee on Energy and Natural Resources, U.S. Senate, Washington, DC.

CHAIRMAN BINGAMAN AND MEMBERS OF THE COMMITTEE,

The United States is faced with a choice today as gas companies are lining up to export inexpensive American gas to foreign markets. We respectfully request that you oppose exporting our natural gas because of the harm to American consumers and our communities.

By choosing to export domestic gas, the United States will:

- Ship huge volumes of U.S. gas to foreign nations. One Liquefied Natural Gas (LNG) tanker can carry away 8.8% of the U.S. daily gas consumption with each shipment.
- Raise energy prices for every American. The U.S. Department of Energy estimated that export from just one Gulf Coast LNG terminal would raise gas prices at Henry Hub in Louisiana by up to 11.6%.[1]
- Undercut U.S. energy independence. While we import expensive OPEC oil, gas companies will make billions sending inexpensive natural gas overseas.
- Condemn land for LNG export. Shockingly, pipelines for LNG export have the power of eminent domain to take private farms and forest lands. Gas companies could condemn private land to send gas overseas, with no public need.
- Increase fracking. Exporting LNG will raise the price of gas, which will make gas companies more aggressive in fracking gas.

Oregon's leading newspaper, the Oregonian framed the idea of exporting U.S. natural gas this way:

> It's a jaw-dropping contradiction, a classic bait-and-switch. It's a thumb-in-the-eye of energy independence and the sort of numbing stupidity that, T. Boone Pickens argues, will confirm our legacy as "the dumbest generation."
>
> Yet we continue to stumble along, strung out between Big Oil and a diminished president, moving inexorably toward the export of this nation's vast reserves of natural gas.[2]

MANUFACTURERS AND CONSUMERS OPPOSE LNG EXPORT

With very little public debate on this important topic, the U.S. Department of Energy recently granted preliminary approval for one of America's first LNG export terminal at Sabine Pass, Louisiana. The Oregonian noted:

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[1] 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

[2] The Oregonian, September 17, 2011, http://www.oregonlive.com/news/oregonian/steve_duin/index.ssf/2011/09/so_much_for_energy_independenc.html

> Paul Cicio, president of the Industrial Energy Consumers of America (750,000 employees strong), has been raging against the U.S. Department of Energy policy for months.
>
> "They should be champions of energy independence," Cicio said Friday. "They're supposed to be looking out for the interests of the public. What this export policy does, instead, is benefit a small handful of exporters to the potential demise of every American and American-manufacturing competitiveness." [3]

In addition, consumer groups oppose LNG export because export will increase the price we pay to heat our homes. A June 16, 2011 letter to this Committee from the American Public Gas Association (APGA) stated:

> APGA is not anit-free trade, but when important policies collide, nations must make choices. APGA submits that the wise policy choice at this critical time in our history is to limit exports of natural gas so that w may realistically pursue the greater goal of energy independence. Those who argue that this matter is not an either-or situation are wagering our long-term national well-being on short-term profits.

Our organizations are also concerned about the effect on our communities, including the impact of building new gas export pipelines through family farms, forestland, and salmon habitat. Columbia Riverkeeper, Rogue Riverkeeper, Friends of Living Oregon Waters and Bark are conservation groups in Oregon and Washington that collectively have thousands of members adversely impacted by proposed LNG terminals and pipelines.

FACTS ON LNG EXPORT

1. LNG terminals were marketed and approved to import gas

All active LNG terminals were approved to import gas. Only in the last year, have the gas companies acknowledged that they intend to export gas. The low price of natural gas in the United States has triggered a wave of recent proposals to export U.S. gas in the form of Liquefied Natural Gas (LNG) into the high-priced Asian and European gas markets. In those markets, gas currently sells for 200% to 300% above U.S. prices.[4] Five of the existing ten LNG import terminals in the United States have publicly announced plans to start exporting LNG. The U.S. Department of Energy (USDOE) recently approved the first export proposal from Cheniere Energy's Sabine Pass LNG terminal in Louisiana.[5] Two LNG export projects have also been proposed in British Columbia[6] and Sempra is considering converting its Baja LNG import terminal to export.[7] All of these terminals were originally permitted to bring gas into the United States. Export proposals represent a major change in the U.S. gas market.

2. LNG companies repeatedly denied plans to export U.S. gas

Exporting U.S. gas as LNG is controversial. Companies behind two proposed LNG import terminals in Oregon have repeatedly denied that they intended to export U.S. gas. The companies told the public and regulators that LNG was needed to increase local gas supplies and therefore decrease consumer prices. As recently as

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[3] 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

[4] Henry Hub price of June 15, 2011 of $4.52/mmbtu. http://www.neo.ne.gov/statshtml/124.htm; Japanese preearthquake LNG prices from January 2011 were $11.96/mmbtu[4] 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-pricesgain. html; http://www.asahi.com/english/TKY201106220170.html.

[5] Sabine Pass terminal, LA (http://www.bloomberg.com/news/2011-05-20/cheniere-surges-45-after-u-s-expands-itslng-export-approval.html); Freeport terminal, TX (http://www.platts.com/RSSFeedDetailedNews/RSSFeed/NaturalGas/6617360); Cameron terminal, TX(http://www.lngworldnews.com/usa-cameron-lng-asks-ferc-for-export-authorization/); Lake Charles terminal, LA (http://www.chron.com/business/energy/article/Energy-companies-seek-export-license-for-LNG-1693487.php); Cove Point terminal, MD (http://www.reuters.com/article/2011/02/01/lng-dominion-export-idUSN0122810220110201)

[6] a100.gov.bc.ca/.../1226700475492 8e248a8d30d89bba23feaf7f461ca741d9738f8be453.pdf; http://www.theglobeandmail.com/report-on-business/industry-news/energy-and-resources/another-bc-company-jumps-onlng-bandwagon/article1955836/

[7] http://www.reuters.com/article/2011/06/07/lng-export-sempra-idUSN079630320110607

March 17, 2011, the World newspaper in Coos Bay, Oregon, newspaper stated, "the project manager of the proposed Jordan Cove LNG terminal hastened Wednesday to disclaim a report that his company was considering changing the terminal into an export facility."[8] The Jordan Cove manager, Bob Braddock, stated that they have had never considered exporting LNG because export "is a stupid idea." [9] Just a few months later, Jordan Cove and other LNG companies now acknowledge plans to export shale gas from the Rockies to the highpriced Asian market. Mr. Braddock stated that their project "provides the most cost effective method for delivering LNG from North America to the Pacific Basin. . ."[10] Just months after calling LNG export "stupid," Mr. Braddock stated, "there is currently no need for import into North America. . . We acknowledge that if anything makes sense, its export."[11] Jordan Cove recently applied for a license to export LNG.

The price of gas in southern Oregon, for example, has averaged $3.9 per million btu (MMbtu) over the last year[12] while the price of LNG in Japan has risen above $14/MMbtu.[13] With China's recent announcement that it plans to increase natural gas use by 300% in the next five years, as well as Japan's increased reliance on LNG following the Fukushima nuclear crisis, Asian LNG prices are only expected to increase.[14]

3. LNG exports would increase consumer natural gas prices and reduce gas supplies

Currently, the U.S. does not have any LNG export terminals. There was an export terminal in Kenai, Alaska, but the plant recently closed after facing strong opposition from industrial and residential gas users who fought re-licensing of the terminal because it was threatening local gas supplies and causing high-gas prices. [15] [16] [17] Other than a fairly small volume of pipeline exports to Mexico and Canada, U.S. consumers alone determine the price for U.S. natural gas. This isolated market for U.S. gas provides U.S. consumers some of the world's lowest natural gas prices.

Opening the door to the export of U.S. gas as LNG, however, could significantly increase the price of natural gas that residential, commercial and industrial customers pay by forcing U.S. consumers to compete in the high-priced Asian and European gas market where LNG prices are often tied to the price of oil.

A recent price impact study relied on by the U.S. Department of Energy estimated that a proposed LNG export terminal in Sabine Pass, LA could increase Henry Hub gas prices (generally used as the U.S. benchmark) by as much as 11.6%.[18] An 11.6% increase in gas prices nationally could hit residential consumers already reeling from the economic downturn with an additional $10 billion a year in natural gas costs,[19] further reducing discretional spending and job growth. The potential for $10 billion in new profits for gas producers if just one export terminal is opened highlights the unprecedented new profits for gas producers if multiple terminals are opened. Exporting LNG will decrease U.S. gas supplies and force U.S. consumers into a bidding war with Asian and European buyers.

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[8] http://theworldlink.com/news/local/article_c6798042-a186-5472-b8bb-c7bf7df57754.html

[9] http://theworldlink.com/news/local/article_c6798042-a186-5472-b8bb-c7bf7df57754.html

[10] Jordan Cove press release Aug. 18, 2011: http://www.oilvoice.com/post/Company News Release/Jordan Cove Confirms Support for World LNG Series Asia Pacific Summit 2011/4b35f2759d.aspx

[11] http://www.oregonlive.com/business/index.ssf/2011/09/el_paso_corp_launches_680-mile.html

[12] Platts LNG Daily, March 15, 2011.

[13] Japanese pre-earthquake LNG prices from January 2011 were $11.96/mmbtu13 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-oilprices-gain.html; http://www.asahi.com/english/TKY201106220170.html.

[14] http://gulfnews.com/business/markets/china-s-natural-gas-push-will-affect-energy-prices-1.829199

[15] http://www.adn.com/2008/11/09/583470/utility-petitions-to-block-gas.html

[16] 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

[17] http://www.adn.com/2011/02/09/1692895/ap-newsbreak-alaska-lng-plant.html

[18] 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

[19] 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

Major energy consumers are 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. The industrial group stated that the price impact of exporting LNG would be "absolutely frightening."[20] T. Boone Pickens has similarly opposed LNG export plans saying, "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.".[21]

It is important to recognize that the 11.6% increased price estimate for Cheniere's export proposal was prepared by Cheniere's own consultants as the company was seeking permission to export LNG. Cheniere likely underestimated the price impact to U.S. gas markets by ignoring the cumulative effect of the other LNG export terminals being planned.[22] Despite the potential for LNG export terminals to drive major prices increases, neither the U.S. Department of Energy nor the Federal Energy Regulatory Commission (FERC) nor any other agency has evaluated the cumulative impacts on gas price and lost jobs from globalizing the price of natural gas in the United States.

4. LNG export terminals could export a significant portion of U.S. gas production

A modern LNG tanker, called a QMAX (266,000 cubic meters[23]), can export more than 8.8 % of total U.S. daily gas production in a single tanker shipment.[24] A recent review by the Pittsburgh Times on the potential for LNG export to increase gas prices, found that if the five already proposed export terminals were approved they would collectively export 13.9% of total U.S. gas production.[25] This, however, did not include either of the potential Oregon terminals or other likely export terminals.

From a Northwest regional price perspective, a single LNG export tanker shipment could export up to 348% more gas than Oregon and Washington collectively use in a single day.[26] The newly opened Ruby Pipeline has just started sending gas from the Rockies Opal Hub in Wyoming to Malin, OR. This would create a direct connection between the proposed Jordan Cove LNG terminal in Coos Bay and the Wyoming gas hub.[27]

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[20] Natural gas prices set to jump with exports—Pittsburgh Tribune-Review http://www.pittsburghlive.com/x/pittsburghtrib/s—741745.html#ixzz1QOd1TrPm

[21] Natural gas prices set to jump with exports—Pittsburgh Tribune-Review http://www.pittsburghlive.com/x/pittsburghtrib/s_741745.html#ixzz1QOd1TrPm

[22] Market Analysis for Sabine Pass LNG Export Project. Prepared by Navigant Consulting. Aug. 23, 2010. On file with author.

[23] http://gcaptain.com/q-max-lng-tankers?4690

[24] Tanker volume: 1 cubic meter of LNG = 20,631 cubic feet of natural gas. See http://www.chemlink.com.au/conversions.htm One 266,000 cubic meter LNG tanker (a QMAX tanker) can carry the equivalent of 5,487,846,000 cubic feet of natural gas. (266,000 cubic meters x 20,631 cubic feet/cubic meter = 5,487,846,000 cubic feet of natural gas per tanker; equivalent of 5.487 bcf of natural gas. Total U.S. natural gas production in 2010. U.S. Energy Information Agency (U.S. EIA) reports 2010 annual U.S. marketed production at 22,568,863,000,000 cubic feet. http://205.254.135.24/dnav/ng/ng_prod_sum_dcu_NUS_a.htm 22,568,863,000,000 cubic feet per year is the equivalent daily marketed production of 61,832,501,370. (22,568,863,000,000 cubic feet per year x 1 year/365 days= 61,832,501,370 cubic feet/day.) Tanker size compared to average daily U.S. marketed production. 5,487,846,000 cubic feet in a single LNG tanker is 8.8% of average daily U.S. marketed natural gas production in 2010 of 7 61,832,501,370 cubic feet. (5,487,846,000 cubic feet per tanker/ average U.S. marketed production 61,832,501,370 = 0.08875 = 8.8 % of average daily U.S. marketed natural gas production in 2010).

[25] Natural gas prices set to jump with exports—Pittsburgh Tribune-Review http://www.pittsburghlive.com/x/pittsburghtrib/s_741745.html#ixzz1QOd1TrPm

[26] Current OR, WA gas usage. Total annual consumption for Oregon: 248,779 mcf (US EIA, 2009 at http://205.254.135.24/dnav/ng/ng—prod—sum—dcu—sor—a.htm); Washington: 310,112 mcf (US EIS 2009 http://205.254.135.24/dnav/ng/ng_cons_sum_dcu_SWA_a.htm). Equivalent average consumption Oregon: 248,779 mcf/year x (1 year/365 days)= 681 mcf= 0.681 bcf; Washington: 310,112 mcf/year x (1 year/365 days)= 849 mcf = 0.849 bcf. Combined Oregon and Washington average daily gas consumption of 1.531 billion cubic feet(bcf) (OR average daily use of 0.681bcf + WA average daily use of 0.849 bcf= 1.531 bcf combined OR and WA use. LNG tanker volume: 1 cubic meter of LNG = 20,631 cubic feet of natural gas. See http://www.chemlink.com.au/conversions.htm One 266,000 cubic meter LNG tanker (a QMAX tanker) can carry the equivalent of 5,487,846,000 cubic feet of natural gas. (266,000 cubic meters x 20,631 cubic feet/cubic meter = 5,487,846,000 cubic feet of natural gas per tanker; equivalent of 5.487 bcf of natural gas. Total U.S. natural gas production in 2010.

[27] http://www.oregonlive.com/business/index.ssf/2011/09/el_paso_corp_launches_680-mile.html

The daily capacity of the two proposed Oregon LNG terminals (1.2 bcf/day for Jordan Cove[28]; 1 bcf/day Oregon LNG)[29] would exceed Oregon's current daily gas use by 293% and combined gas consumption of both Oregon and Washington by 130%.[30] Two additional export terminals planned in Kitimat British Columbia, would further add to the Northwest price pressure by exporting gas currently supplied to Oregon and Washington, into the Asian LNG market.[31] Because Sempra has also acknowledged considering LNG export from its Costa Azul LNG terminal in Baja, Mexico, there is a very real potential for five west coast LNG export terminals in the near future.[32]

As a result, if even one LNG export terminal were opened in Oregon, those purchasing LNG from the terminal would quickly become the dominant gas purchasers and price setters in the Northwest. Given the high price of the Pacific Rim LNG market, gas suppliers would presumably only sell gas to Northwest consumers if they paid a price equal to or greater than the Pacific Rim buyers after subtracting the costs of export, thus leading to significantly increased domestic prices. While this price has not been calculated, there is little question that it would be significantly higher than the current prices being paid by Northwest consumers.

Exporting LNG to higher-priced foreign markets may increase natural gas fracking in the United States. Gas companies will have incentive to drill in more locations using unconventional methods to reach gas that is currently uneconomical.

CONCLUSION

Exporting domestic natural gas to foreign nations will raise gas prices, harm manufacturers and consumers, and degrade our communities by increasing natural gas pipelines and fracking. We respectfully request that this Committee call for an investigation on the price impact of LNG export to American consumers. The U.S. Department of Energy or FERC should not approve any LNG export licenses until a full evaluation is complete.

Sincerely,

BRETT VANDENHEUVEL,
Columbia Riverkeeper,
Hood River, OR, White Salmon, WA.

LESLEY ADAMS,
Rogue Riverkeeper,
Ashland, OR.

GAYLE KISER,
Landowners and Citizens for a Safe Community,
Longview, WA.

BETHANY COTTON,
Friends of Living Oregon Waters,
Grants Pass, OR.

OLIVIA SCHMIDT,
Bark,
Portland, OR.

MONICA VAUGHN,
Klamath Siskiyou Wild Lands Center,
Ashland, OR.

STATEMENT OF KENNETH D. MCCLINTOCK, SECRETARY, STATE OF PUERTO RICO

The Government of Puerto Rico supports the safe and responsible development of natural gas resources in the United States. Development of these resources will help create needed jobs, allow regulated entities more flexibility in satisfying environmental goals under the Clean Air Act and other statutes, and provide energy security for future generations. As part of the development of these resources, Puerto

[28] www.ferc.gov/industries/gas/indus-act/lng/LNG-approved.pdf
[29] www.oregonlng.com/pdfs/olng fercfiling rls 10-10-08.pdf
[30] Current OR, WA gas usage. 2009 US EIA data gas usage: OR average daily gas usage of 0.681 bcf/day; WA average daily gas usage of 0.849 bcf/day, compared to 2 bcf/day of initial export capacity (1 bcf/day for Jordan Cove approved by FERC; 1 bcf/day Oregon LNG proposed for approval.)
[31] a100.gov.bc.ca/.../1226700475492 8e248a8d30d89bba23feaf7f461ca741d9738f8be453.pdf; http://www.lngworldnews.com/canada-jv-proposes-second-kitimat-lng-terminal/
[32] http://www.reuters.com/article/2011/06/07/lng-export-sempra-idUSN079630320110607

Rico is embarking on its own program to use natural gas as a bridge fuel to generate needed electric power for the Islands.

Historically, the demand for natural gas in the United States has exceeded the available supply. The development of shale gas resources, however, is increasing supplies substantially to the point that additional uses and markets will be able to benefit from the availability of U.S. natural gas.

Puerto Rico, a territory of the Unites States, presents a unique domestic U.S. market for this natural gas and is examining the possibility of receiving supplies in the form of liquefied natural gas (LNG). The ability of the U.S. natural gas industry to supply natural gas as LNG presents a tremendous opportunity for the American citizens of Puerto Rico. The government of Puerto Rico is seeking to secure a long-term source of natural gas in the form of LNG, and is pursuing the possibility of deliveries from the mainland U.S. to Puerto Rico.

In order to facilitate the interstate supply of natural gas from our Nation's Gulf Coast to Puerto Rico's South Coast, last December we placed a statement of support in the Department of Energy (DOE) docket regarding the request of Cheniere Energy, Inc. for a permit to allow its Sabine Pass, Louisiana, terminal not only to receive LNG but also to dispatch shipments on an interstate basis to Puerto Rico and on an export basis to foreign buyers.

Puerto Rico currently lags far behind the rest of the United States in terms of having an economically efficient electric generation system. Puerto Rico produces 68% of its power from imported foreign diesel and bunker fuels which makes electricity far more expensive than in the rest of the United States. Because of this, the price of electricity in Puerto Rico is more than double the average price in the United States (10.2 cents) and has reached as high as 29 cents per KWh this year. These high energy costs have been economically debilitating to Puerto Rico's economy.

In order to begin addressing these high prices, the Government of Puerto Rico and the Puerto Rico Power Electric Authority (PREPA) are moving forward on plans to convert much of the Islands' generation from foreign oil to natural gas. Converting to natural gas makes good sense for Puerto Rico because natural gas is a clean, abundant and less expensive fuel source.

One of the key initiatives in this area is the Via Verde pipeline project. This project, which would span approximately 92 miles, will transport natural gas from an existing LNG terminal, which is owned by EcoElectrica on Puerto Rico's south coast to PREPA's generation plants in the north. The pipeline will be built with state of the art technology and has been carefully planned to use the rights-of-way of existing highways in order to minimize impact on local communities as well as sensitive or protected fauna and flora habitats.

This project has significant economic and environmental benefits. Once Via Verde is implemented, it is expected to save energy consumers on the Island hundreds of millions of dollars per year. In addition, emissions of criteria pollutants are expected to decrease as much as 79% and greenhouse gases by 30%.

Puerto Rico's conversion to natural gas has the potential to create a large domestic U.S. market in the near future for those U.S. natural gas companies with available natural gas supplies. By 2016, PREPA estimates that it will be purchasing as much as 1.13 billion cubic feet (BCF) of LNG per year. Since Puerto Rico is a territory of the United States, our Government has a strong preference to obtain this supply on a long-term basis from U.S. companies, rather than foreign sources thus helping the Nation's balance-of-payments.

In closing, the Government of Puerto Rico fully supports the safe and responsible development of natural gas resources in the United States. We will work with U.S. natural gas suppliers and other interested parties to develop supply arrangements that will enable Puerto Rico to implement our upcoming conversion of electric generation from foreign oil to domestic natural gas.

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