

# UNCONVENTIONAL FUELS, PART I: SHALE GAS POTENTIAL

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## OVERSIGHT HEARING

BEFORE THE

SUBCOMMITTEE ON ENERGY AND  
MINERAL RESOURCES

OF THE

COMMITTEE ON NATURAL RESOURCES  
U.S. HOUSE OF REPRESENTATIVES

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# **OVERSIGHT HEARING ON “UNCONVENTIONAL FUELS, PART I: SHALE GAS POTENTIAL”**

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**Thursday, June 4, 2009  
U.S. House of Representatives  
Subcommittee on Energy and Mineral Resources  
Committee on Natural Resources  
Washington, D.C.**

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The Subcommittee met, pursuant to call, at 10:05 a.m. in Room 1334 Longworth House Office Building, Hon. Jim Costa, [Chairman of the Subcommittee] presiding.

Present: Representatives Costa, Lamborn, Faleomavaega, Holt, Boren, Heinrich, Hinchey, Sarbanes, Gohmert, Fleming and Lummis.

Also Present: Representative DeGette

## **STATEMENT OF THE HONORABLE JIM COSTA, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF CALIFORNIA**

Mr. COSTA. Good morning. The Subcommittee on Energy and Mineral Resources, as part of the larger Natural Resources Committee, will now come to order.

The hearing this morning is on, I believe, an important topic as we look at the full panoply of, as I like to say, energy tools that are in our energy toolbox as we look in the 21st Century to developing a comprehensive energy policy we hope will deal with the challenges that we face in this country—both at home and abroad. This relates to America’s efforts to improve the quality of our air from a region-to-region standpoint, to reduce our dependence on foreign sources of energy, and to deal with the transition of all the various energy options that are out there as we try to build a robust renewable energy portfolio. At the same time, we need to take advantage of those more traditional energy resources, like oil and gas, that have been really the backbone of our economy in the 20th Century—and how we deal with using all of those efforts in a smart, common-sense way that is economically effective as America rebuilds its economy dealing with a needed comprehensive energy package.

The way this morning’s hearing fits into all of that is by focusing more on whether or not these various fuels—while natural gas is not a new fuel—how the development of this fuel from shale fits with our newer options on fuels. In fact, do we need more time for research and development as we look at these new technologies?

What are the benefits and tradeoffs that are associated with various fuels, such as, in this case, the efforts to deal with water use, cost competitiveness and the impacts on climate?

Shale gas actually is not new. I am told that the development has been for almost some 50 years, but its application and its potential is, I think, exciting as we look at the prospects. Shale gas could be developed as a sizable part of this energy portfolio that I spoke of a moment ago. When you look at the map of the United States, we believe the technological advances already are unlocking potentially huge reservoirs of that natural gas from shale.

Just in one shale play located in Texas called the Barnett Shale play, it produces six percent of all the natural gas that is developed in the United States today. The Barnett could soon be dwarfed by other shale gas plays that have been identified in other regions of the United States. The Marcellus Shale Formation alone may contain enough natural gas to supply the Nation with its current use for 15 years at the current rate of consumption of natural gas. That is incredible when you think about it.

Capitalizing on this vast resource without, I think, a complementary, proactive effort as we look at how that is developed between state laws and the Federal energy policy, how we deal with questions of commercial, technical and environmental issues that are all a part of that discussion, is what we would like to examine here today. There are clearly business risks that have been associated with shale gas and, of course as we know, natural gas prices certainly influence the development.

In certain regions of the country, we have tradeoffs that are very important—air quality, for example. In California, we have two regions, the South Coast Basin, which most people are familiar with—the Los Angeles area. That is a nonattainment area. The area that I represent, the San Joaquin Valley, is a nonattainment area as well. We have sanctions. We have air quality issues that we have to meet. Natural gas, therefore, in those kinds of regions where you have nonattainment is today the energy de jour because, in fact, of its clean-burning qualities.

We also have issues that impact land use, and we will hear about some of those this morning, and as I mentioned a moment ago—water. Some states are considering limits on drilling until the issues of water and wastewater supply are resolved. What we want to look at is what solutions are available as we develop this shale gas, what is the appropriate role between states and the Federal government as we capitalize on shale gas.

We look forward to this panel's expertise this morning that includes geologists, a business perspective, a perspective on regulations, on water and sustainability concerns. I hope I have framed the debate and the testimony this morning and look forward to the questions that Members will ask and raise as it relates to this important fuel that seems to be available in significant amounts in the United States. I will defer now to my Ranking Member, Mr. Doug Lamborn, from Colorado for an opening statement that he may have, and then we will get to the witnesses.

[The prepared statement of Mr. Costa follows:]

**Statement of The Honorable Jim Costa, Chairman,  
Subcommittee on Energy and Mineral Resources**

Today is the first of a series of hearings on unconventional fuels. I expect this series will provide opportunities to examine such critical questions as: which unconventional fuels are ready for prime time in our energy portfolio, which need more time for research and technological development, and what are the benefits and tradeoffs associated with various unconventional fuels, such as water use, cost-competitiveness, and climate impacts?

Shale gas is the first resource we will examine. Shale gas could be a sizeable part of our energy portfolio in just a few years. Technological advances are already unlocking huge reserves of natural gas from shale. Just one shale play, the Barnett in Texas, produces 6% of all U.S. natural gas. Yet the Barnett could soon be dwarfed by other shale gas plays. Here in the east, the Marcellus Shale formation alone may contain enough natural gas to supply the nation for 15 years at current rates of consumption.

However, capitalizing on this vast resource may be delayed without proactive efforts to answer questions—commercial, technical, environmental. For example, there are business risks associated with shale gas. Natural gas prices influence development. Landowner concerns are emerging. And, some states are considering limits on drilling until water supply and wastewater issues are resolved.

Today, I hope we will learn about solutions that are available to help citizens, states, and the federal Government capitalize on shale gas. I look forward to today's panel, including geologists, the business outlook, and perspectives on regulations and water and sustainability concerns.

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**STATEMENT OF THE HONORABLE DOUG LAMBORN, A  
REPRESENTATIVE IN CONGRESS FROM THE STATE OF  
COLORADO**

Mr. LAMBORN. Thank you, Mr. Chairman, and I want to thank you also for holding this important hearing today on the potential of the nation's shale gas resources and the role they can play in meeting our country's energy needs now and in the future. While we are here to discuss the importance of this unconventional resource in meeting part of our current and future energy needs, I found it interesting to learn that the first natural gas well completed in the U.S. was in New York State more than 185 years ago and was a shale gas well.

Today, shale gas and other unconventional natural gas sources, such as tight sands and coalbed methane, provide more than 47 percent of the natural gas consumed in the U.S. annually. According to the Energy Information Administration, by 2030 these unconventional natural gas resources will provide 56 percent of the natural gas consumed by the United States.

All of this was made possible through the development of the Barnett Shale in Texas in the 1980s and 1990s, as was alluded to by the Chairman, where innovative drilling techniques—horizontal drilling combined with the safe, longstanding practice of hydraulic fracturing—demonstrated that this unconventional fuel could be produced on a large scale economically. Development of the Barnett Shale gas play paved the way and sparked interest in other shale gas basins throughout the U.S.

The Bakken in South Dakota, the Haynesville in Louisiana, and the Marcellus in the northeastern U.S., to name a few. While this is a great opportunity for the country to have access to a significant reserve of clean-burning fuel well into the future, for some unfamiliar with the oil and gas industry it has raised concerns about the practice of hydraulic fracturing. Hydraulic fracturing has been used by the oil and gas industry since the late 1940s.

More than one million fracturing jobs have been completed in the U.S. since the technique was first developed, and there have been no demonstrated adverse impacts to drinking water wells from the fracking process or by the fluids used in the process.

Testifying before us today, we have Mr. Scott Kell, President of the Groundwater Protection Council, which recently completed two reports for the Department of Energy: "Modern Shale Gas Development in the United States: A Primer" for the U.S. and "State Oil and Gas Regulations Designed to Protect Water Resources," and Mr. Lynn Helms, Director of the Oil and Gas Division for the North Dakota Industrial Commission.

I anticipate that their testimony will address some of the concerns that people have about the practice of hydraulic fracturing and the level of environmental protection and regulations specific to oil and gas development. I also look forward to hearing from our other witnesses, Mr. Duncan, Mr. John and Mr. Appleton.

Before I finish my remarks, I would like to thank the Chairman of this Subcommittee for considering holding a hearing on oil shale as part of the series on unconventional fuels. In the future, oil shale will play a significant role in our energy mix. While estimates vary, the United States Geological Survey says the oil shale in Colorado, Wyoming and Utah contains more than one trillion barrels of recoverable oil, a crucial fuel for the transportation sector.

By the way, that would be three to four times the reserves of Saudi Arabia, and I am not just talking about cars, but planes, trains, trucks and ships. As some people have pointed out, there are no hybrid jet engines. I believe for the United States to improve both its economic and national security, we will have to develop more of our own resources, renewable resources, such as wind and solar, other renewable resources such as hydropower, geothermal, biomass as well as nuclear, but also our conventional and unconventional energy resources.

We must recognize that we will need to use our fossil fuels well into the future. Whether we like it or not, the rest of the world and ourselves are highly dependent on these fuel sources, and they are fully integrated into our society today. These are the energy resources that fuel our nation's economy and the economy of the world. This is an undeniable fact.

Thank you again, Mr. Chairman, for holding this hearing today and exploring this important topic in the future for unconventional fuels. I look forward to hearing from our witnesses on this great natural resource, and I yield back.

[The prepared statement of Mr. Lamborn follows:]

**Statement of The Honorable Doug Lamborn, Ranking Republican,  
Subcommittee on Energy and Mineral Resources**

I want to thank you Mr. Chairman for holding this important hearing today on the potential of the Nation's shale gas resources and the role they can play in meeting our country's energy needs now and in the future.

While we're here to discuss the importance of this unconventional resource in meeting part of our current and future energy needs, I found it interesting to learn that the first natural gas well completed in the U.S. was in New York state more than 185 years ago and was a shale gas well.

Today shale gas and other unconventional natural gas sources such as tight sands and coal bed methane provide more than 47 percent of the natural gas consumed in the U.S. annually. According to the Energy Information Administration, by 2030



these unconventional natural gas resources will provide 56 percent of the natural gas consumed by the United States.

All of this was made possible through development of the Barnett Shale in Texas in the 1980s and 1990s, as you alluded to, where innovative drilling techniques, horizontal drilling, combined with the safe long standing practice of hydraulic fracturing, demonstrated that this unconventional fuel could be produced on a large scale economically.

Development of the Barnett shale gas play paved the way and sparked interest in other shale gas basins throughout the U.S.—the Bakken in South Dakota, the Haynesville in Louisiana, and the Marcellus in the Northeastern U.S. to name a few.

While this is a great opportunity for the country to have access to a significant reserve of clean burning fuel well into the future, for some unfamiliar with the oil and gas industry, it has raised concern about the practice of hydraulic fracturing.

Hydraulic fracturing has been used by the oil and gas industry since the late 1940s. More than 1 million fracturing jobs have been completed in the U.S. since the technique was first developed. And there have been no demonstrated adverse impacts to drinking water wells from the “fracking” process or by the fluids used in the process.

Testifying before us today we have Mr. Scott Kell, President of the Ground Water Protection Council which, recently completed two reports for the Department of Energy: “Modern Shale Gas Development in the United States: a Primer for the U.S.” and “State Oil and Gas Regulations Designed to Protect Water Resources” and, Mr. Lynn Helms, Director of the Oil and Gas Division for the North Dakota Industrial Commission.

I anticipate that their testimony will address some of the concerns that people have about the practice of hydraulic fracturing and the level of environmental protection and regulations specific to oil and gas development.

I also look forward to hearing from our other witnesses: Mr. Duncan, Mr. John and Mr. Appleton.

Before I finish my remarks I would like to thank the chairman of the subcommittee for considering holding a hearing on oil shale as part of the series on Unconventional Fuels.

In the future, oil shale will play a significant role in our energy mix. While estimates vary, the United States Geological Survey says the oil shale in Colorado, Wyoming and Utah contains more than 1 trillion barrels of recoverable oil—a crucial fuel for the transportation sector. And I’m not just talking about cars—but planes, trains, trucks and ships. As some people have pointed out there are no hybrid jet engines.

I believe for the United States to improve both its economic and national security, we will have to develop more of our own resources—renewable resources such as wind and solar, other renewable resources such as hydropower, geothermal, biomass, and nuclear—but also our conventional and unconventional energy resources.

We must recognize that we will need to use our fossil fuels well into the future. Whether we like it or not we and the rest of the world are highly dependent on these fuel sources and they are fully integrated into our society. These are the energy resources that fuel our Nation’s economy and the economy of the world. This is an undeniable fact.

Thank you again Mr. Chairman for holding this hearing today and exploring this important topic in the future. I look forward to hearing from our witnesses on this great national resource.

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Mr. COSTA. Thank you very much, Ranking Member. I appreciate your comments on the way we are trying to frame the hearing this morning.

Planes, trains and automobiles. Maybe we want to make a movie. No. I guess it has already been done. Members of the Subcommittee, I want to thank you very much for your participation here this morning in advance, and it is the intention of the Chairman to get right into the heart of the testimony by having our witnesses testify, and that way we can ask our questions based upon their comments. I think that is a good way to get into it.

Our witnesses are Mr. Douglas Duncan, the Associate Coordinator of the Energy Resources Program for the United States Geo-

logical Survey; Mr. Scott Kell, President of the Ground Water Protection Council; Mr. Mike John, Vice President of Corporate Development and Government Relations for the Eastern Division of the Chesapeake Energy Corporation; Mr. Lynn Helms, the Director of Oil and Gas Division for the North Dakota Industrial Commission.

Our fifth witness is Mr. Albert Appleton, an Infrastructure and Environmental Consultant and the former Director of the New York City Water and Sewer System. Those make up the five members of this panel that we look forward to their testimony. For those who are testifying this morning who have not had that opportunity before, the archaic system of the House is that we keep you to five minutes, so the Chairman looks kindly on those who stay within the five minutes.

The green light is on for the first four minutes, and then the yellow light gives you a minute to kind of summarize your comments, and if the red light is on for too long, you will incur the disfavor of the Chairman, so you are on your own, gentlemen. Let us begin first with Mr. Douglas Duncan, the Associate Coordinator of the Energy Resources Program for the United States Geological Survey. Mr. Duncan.

**STATEMENT OF DOUGLAS DUNCAN, ASSOCIATE COORDINATOR, ENERGY RESOURCES PROGRAM, UNITED STATES GEOLOGICAL SURVEY**

Mr. DUNCAN. Thank you very much. Mr. Chairman and Members of the Subcommittee, thank you for the opportunity to appear here today to discuss with you the U.S. Geological Survey's role in studying, understanding and assessing the unconventional gas resources of the Nation exclusive of the Federal offshore and the world.

Mr. COSTA. Could you bring that mic a little closer to you.

Mr. DUNCAN. I am sorry. I can do that. Is that better?

Mr. COSTA. We want everybody to hear you.

Mr. DUNCAN. All right. Do I need to start over, or are you cool?  
OK.

Mr. COSTA. We got your name.

Mr. DUNCAN. All right. The U.S. currently consumes about 21 percent of the energy resources produced in the world, and thus the volumes, quality and availability of domestic and foreign energy resources are of critical importance to the U.S.

The USGS Energy Resources Program provides research and assessment on the conventional oil, gas and coal resources, emerging resources such as gas hydrates, under-utilized resources, such as geothermal, and unconventional resources, such as shale gas and oil shale. We also provide research on the effects associated with energy resource occurrence, production and utilization of the Nation exclusive of the Federal offshore waters and the world.

The USGS distinguishes between conventional and continuous petroleum accumulations for purposes of research and resource assessment. Briefly stated, conventional accumulations are described in terms of discrete fields or pools localized in traps by the buoyancy of oil or gas and water. Now, in contrast, continuous accumulations are oil or gas accumulations that have large spatial dimen-

sions and indistinctly defined boundaries and exists more or less independently of the water column.

Examples of continuous accumulations are shale gas and coalbed gas, which are among the fastest growing domestic energy resources. Now, results from the current USGS effort to update our national assessments for undiscovered, technically recoverable continuous gas resources are estimated to be a mean of 364 trillion cubic feet. This is exclusive again of Federal waters.

With respect to the Energy Resources Program work outside of the United States, the USGS has conducted assessments on conventional oil and gas resources only as little data exists on global continuous or unconventional accumulations. Currently, the USGS is conducting a screening exercise, which will evaluate the availability of information for estimates of continuous petroleum resources outside the U.S.

Continuous resources have the potential to significantly contribute to the global petroleum endowment, but scientifically vetted characterization and quantitative estimates of those resources must be available before their true potential can be evaluated. As the nation's energy mix evolves, the USGS will continue to adapt its research and assessment portfolio. USGS resource assessments in research are an integral part of the public and government discourse about the energy resource future of the Nation and allow science to inform and advise and engage decisionmakers.

The USGS stands ready to assist Congress as it examines these challenges and opportunities. Thank you for this opportunity to provide an overview of the USGS research and assessments of natural gas and other energy resources. I would be happy to answer your questions.

[The prepared statement of Mr. Duncan follows:]

**Statement of Douglas Duncan, Research Geologist, U.S. Geological Survey,  
U.S. Department of the Interior**

Mr. Chairman and Members of the Subcommittee, thank you for the opportunity to appear here today to discuss with you the U.S. Geological Survey's role in studying, understanding, and assessing the unconventional gas resources of the Nation (exclusive of the Federal offshore) and the World.

**Introduction**

Adequate, reliable, and affordable energy supplies obtained using environmentally sustainable practices are essential to economic prosperity, environmental and human health, and political stability. National and global consumption of fossil fuels are projected to increase over the next several decades, though at a slower rate than in recent years. The projected increase in U.S. consumption is due, in part, to greater anticipated domestic unconventional gas supplies. The Energy Information Administration (EIA) Annual Energy Outlook 2009 projects substantial increases in domestic production of oil, natural gas, and coal, with renewable resources accounting for a rapidly increasing, but still smaller, proportion of the total energy mix under the current policy baseline. Although the impact of new policies aimed at creating a low-carbon economy may increase the speed of this transition to renewable sources, conventional energy resources are expected to remain an important component of our energy mix for some time to come.

The United States currently consumes about 21 % of the energy resources produced in the world. Thus, the volumes, quality, and availability of domestic and foreign energy resources are of critical importance to the United States. The Nation continues to face important decisions regarding the competing uses of public lands and offshore waters, the supply of energy to sustain development and enable growth, and the environmental effects of energy resource development.

### **Role of the U.S. Geological Survey**

The U.S. Geological Survey (USGS) Energy Resources Program (ERP) provides the information needed to address these challenges by conducting scientific investigations of geologically based energy resources, including research and assessment on the geology of conventional oil, gas, and coal resources; emerging resources such as gas hydrates; underutilized resources such as geothermal; and unconventional resources such as shale gas and oil shale, as well as research on the environmental effects associated with energy resource occurrence, production, and (or) utilization. The mission of the ERP is: (1) to understand the processes critical to the formation, accumulation, occurrence, and alteration of geologically based energy resources; (2) to conduct scientifically robust assessments of those resources; and (3) to study the impact of energy resource occurrence and (or) production and use on both environmental and human health. The results from these geoscientific studies are used to evaluate the quality and distribution of energy resource accumulations and to assess the energy resource potential of the Nation (exclusive of Federal offshore waters) and the World. (Federal offshore waters are assessed by the Minerals Management Service of the Department of the Interior.)

The results from these USGS studies provide impartial, robust scientific information about energy resources that directly supports the U.S. Department of the Interior's (DOI's) mission of protecting and responsibly managing the Nation's natural resources; USGS information is used by policy and decision makers, land and resource managers, other federal and state agencies, the domestic energy industry, foreign governments, nongovernmental groups, academia, other scientists, and the public. As one example, current findings from the USGS National Oil and Gas Assessment (NOGA) provide updated scientific information on the mean estimates for undiscovered, technically recoverable oil and gas resources underlying the onshore U.S. and State-owned waters. They indicate that the total 47.5 billion barrels of oil and 743 trillion cubic feet of gas, respectively (Figure 1A & B).

Collectively, information from USGS research advances the scientific understanding of energy resources, contributes to plans for a balanced and secure energy future, and facilitates the strategic use and evaluation of resources.

### **USGS National Resources Research and Assessment Activities**

The overall goal of USGS domestic energy activities is to conduct research and assessments of all geologically based energy resources. This includes undiscovered, technically recoverable oil and natural gas resources, both conventional and continuous (also referred to as unconventional), of the United States (exclusive of the Federal offshore). These are resources that have yet to be found (drilled), but if found, could be recovered using currently available technology and industry practice (without regard to economic viability). The purpose of USGS assessments is to develop robust, geology-based, statistically sound, well-documented estimates of quantities of energy resources having the potential to be added to reserves, and thus contribute to the overall energy supply. The USGS uses resource assessment methodologies that are thoroughly reviewed and externally vetted so as to maintain the transparency and robustness of the assessment results.

In recent years, the USGS has distinguished between conventional and continuous petroleum accumulations for purposes of research and resource assessment (Figure 2). Briefly stated, conventional accumulations are described in terms of discrete fields or pools localized in structural or stratigraphic traps by the buoyancy of oil or gas in water. In contrast, continuous accumulations are petroleum accumulations (oil or gas) that have large spatial dimensions and indistinctly defined boundaries, and which exist more or less independently of the water column. Examples of continuous accumulations are shale gas and coalbed gas, which are among the fastest growing domestic energy resources.

The current USGS effort to update national (onshore and State waters) assessments of oil and gas resources is done in support of the Energy Policy and Conservation Act (EPCA) Amendments of 2000 (P.L. 106-469 §604). The USGS assesses the potential volumes of conventional and continuous (unconventional) resources (e.g. coalbed gas, shale gas, tight gas sands) in each priority province using established, externally reviewed and vetted methodologies, and provides this information to the appropriate land and resource management agencies for subsequent analysis. The Energy Policy Act of 2005 (P.L. 109-58) re-authorized EPCA 2000 assessment activities by the USGS, emphasizing the unique role of the USGS, and specifically mandated that "the same assessment methodology across all geological provinces, areas, and regions [be used] in preparing and issuing national geological assessments to ensure accurate comparisons of geological resources." The current mean estimate for the United States as a whole for undiscovered, technically recoverable continuous gas resources is 364 trillion cubic feet (Figure 3).

The amount of undiscovered, technically recoverable resources changes over time. There are several reasons for this, including scientific and technological developments regarding petroleum resources in general, improvements to the geologic understanding in numerous settings, and reserve growth. These advances in geologic understanding, as well as changes in technology and industry practices, necessitate that resource assessments be periodically updated. This is especially true for continuous (unconventional) resources. New technological developments increase the recoverability of this challenging resource, and our geologic understanding of these resources is evolving. One example of this change is the recently updated USGS assessment of the Bakken Formation in the U.S. portion of the Williston Basin. This assessment, released in 2008, shows an estimated 3.0 to 4.3 billion barrels of undiscovered, technically recoverable, continuous oil compared to the agency's 1995 mean estimate of 151 million barrels of oil. Assessments of unconventional natural gas resources, including the Barnett Shale, the Marcellus Shale, and others, have shown the same type of increase as our understanding of the geology increases. Much of the technology developed for production of the gas in the Barnett Shale is being used to extract the oil in the Bakken Formation, and these technological advances accounted for the large change in what was considered technically recoverable. The Barnett Shale Newark East field now ranks second in the United States in terms of annual gas production (EIA, [http://www.eia.doe.gov/pub/oil\\_gas/natural\\_gas/data\\_publications/crude\\_oil\\_natural\\_gas\\_reserves/current/pdf/appb.pdf](http://www.eia.doe.gov/pub/oil_gas/natural_gas/data_publications/crude_oil_natural_gas_reserves/current/pdf/appb.pdf)). Cumulative gas production from January 1993 to January 2006 from the Barnett Shale Newark East field was about 1.8 trillion cubic feet; in 2005, gas production was about 480 billion cubic feet compared to less than 11 billion cubic feet in 1993 (Texas Railroad Commission, 2006, available at <http://www.rrc.state.tx.us/data/fielddata/barnettshale.pdf>).

#### **U.S. Geological Survey International Energy Studies**

Our Nation depends heavily on imported energy resources: about 57 percent of the oil and 16 percent of the natural gas consumed in the United States come from imports. Given the significance of imported oil and gas to the U.S. energy mix, scientifically valid, unbiased assessments of the world's remaining endowment of petroleum accumulations are very important. For this reason, global petroleum resource assessments are a core USGS research activity and have significant global visibility. The USGS world oil and gas resource estimates are used as a standard reference by many organizations including the Energy Information Administration (EIA) and the International Energy Agency (IEA).

The overall objectives of USGS studies of international petroleum resources are to continue providing high-quality, comprehensive petroleum assessments and to update previous assessments as needed. A major focus of recent USGS research in this area is the global Circum-Arctic Resource Appraisal, the primary emphasis of which is to provide a comprehensive, unbiased probabilistic estimate of potential future additions to conventional oil and gas reserves in the high northern latitudes. The Arctic is an area of high petroleum resource potential, low data density, high geologic uncertainty, and sensitive environmental conditions. The assessment is the first publicly available petroleum resource estimate of the entire area north of the Arctic Circle. Results indicate that the area north of the Arctic Circle has an estimated mean of 90 billion barrels of undiscovered, technically recoverable oil, 1,670 trillion cubic feet of technically recoverable natural gas, and 44 billion barrels of technically recoverable natural gas liquids in 25 geologically defined areas thought to have potential for petroleum. These resources account for about 22 percent of the undiscovered, technically recoverable resources in the world. The Arctic accounts for about 13 percent of the undiscovered oil, 30 percent of the undiscovered natural gas, and 20 percent of the undiscovered natural gas liquids in the world. About 84 percent of the estimated resources are expected to occur offshore.

Outside of the United States, the USGS has conducted assessments on conventional oil and gas resources only, as little data exist on global continuous (unconventional) accumulations. Currently the USGS is conducting a screening exercise to evaluate the availability of information for resource estimates of continuous petroleum resources outside the United States. Continuous resources have the potential to significantly contribute to global petroleum resources, but scientifically-vetted characterization and quantitative estimates of these resources must be available before their true potential can be evaluated.

#### **Conclusion**

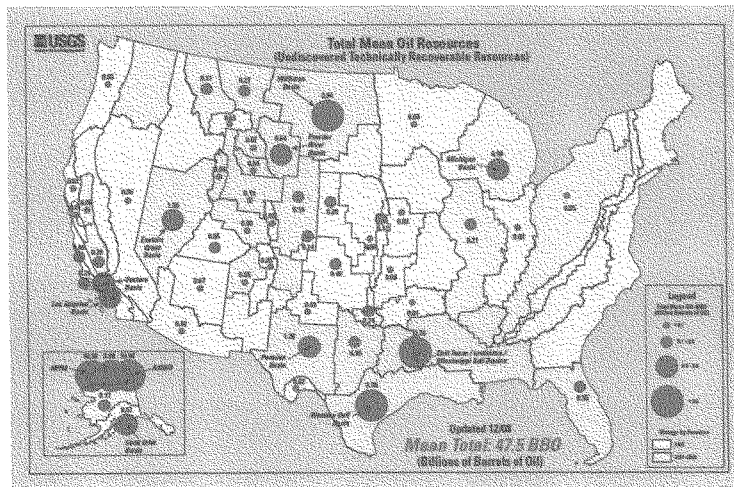
During the next decade, the Federal Government, industry, and other groups will need to better understand the domestic and global distribution, genesis, use, and consequences of using geologically based energy resources to address national secu-

rity issues and climate change, manage the Nation's domestic supplies, predict future needs, anticipate as well as guide changing patterns in use, facilitate creation of new industries, and secure access to appropriate supplies. Energy resources research and assessments are a traditional strength of the USGS, and these activities provide impartial, robust information necessary for the many needs just outlined. As the Nation's energy mix evolves, the USGS will continue to adapt its research and assessment portfolio to include a comprehensive suite of energy sources that reflects the highest priority needs of the nation. USGS resource assessments and research are an integral part of the public and government discourse about the energy resource future of the Nation, and allow science to inform, advise, and engage decision makers. The USGS stands ready to assist Congress as it examines these challenges and opportunities.

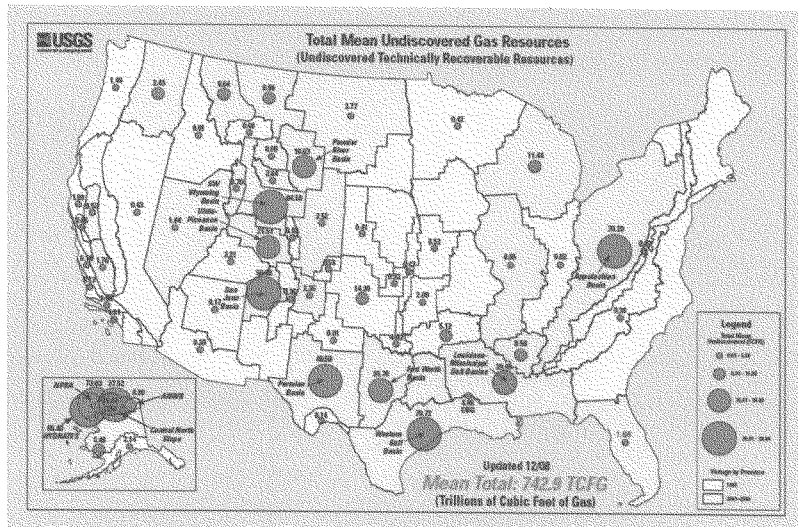
Thank you for this opportunity to provide an overview of USGS research and assessments of natural gas and other energy resources. I would be happy to answer your questions.

**Figure 1.** Current mean estimates from the USGS NOGA Project for undiscovered, technically recoverable resources of (A) oil and (B) natural gas. Additional information from the USGS NOGA project is available from: <http://energy.cr.usgs.gov/oilgas/noga/>.

A.



B.



**Figure 2.** Conceptual diagram illustrating the different geologic settings between conventional and continuous resource accumulations.

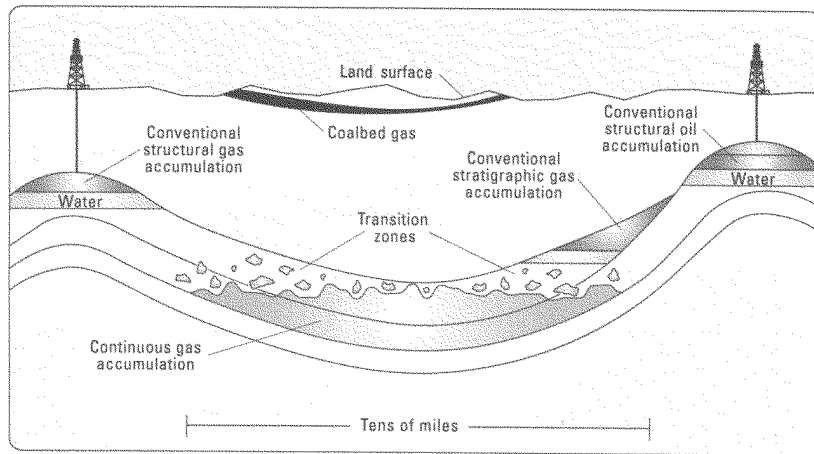
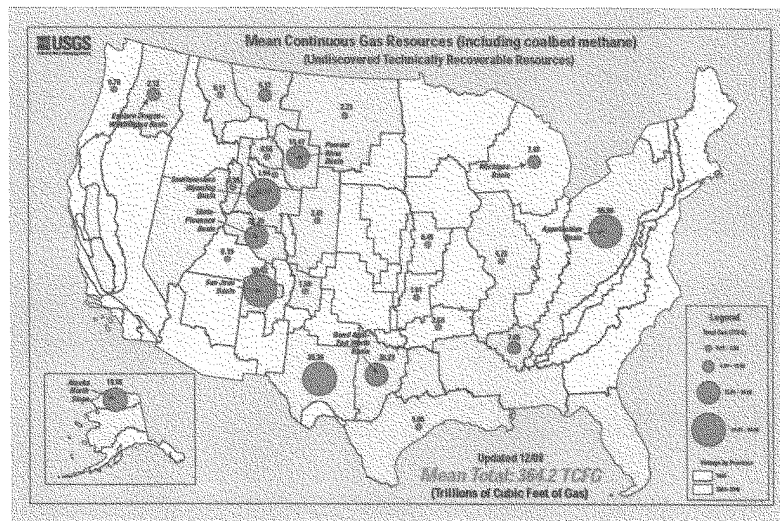


Figure 3. Current mean estimates from the USGS NOGA Project for undiscovered, technically recoverable continuous natural gas. Additional information from the USGS NOGA project is available from: <http://energy.cr.usgs.gov/oilgas/noga/>.



Mr. COSTA. Thank you very much, Mr. Duncan. I hoped that the U.S. Geological Survey would have gotten into a little more of the detail in terms of the impacts and the understandings with regards to natural gas from shale, but we will get back to that in terms of the questions. The Chairman will be noted for your brevity. Our next witness is Mr. Scott Kell, who is the President of the Ground Water Protection Council.

**STATEMENT OF SCOTT KELL, PRESIDENT,  
GROUND WATER PROTECTION COUNCIL**

Mr. KELL. Mr. Chairman, thank you for the opportunity to testify here today. My name is Scott Kell. I am President of the Ground Water Protection Council and appear here today on its behalf. I am also deputy chief of the Ohio Division of Mineral Resources Management, and in that capacity, I implement the regulations for oil and gas exploration and development within the State of Ohio.

As a state program director and as a member of the Ground Water Protection Council, who works with other state program directors, I can assure you that in the exercise of our authorities that the state directors are committed to the stewardship of water resources. The Ground Water Protection Council, or GWPC, is a non-profit association of state agencies responsible for the environmental safeguards related to groundwater.



The GWPC provides a forum through its state members, work with Federal scientists and regulators, environmental groups, industry and other stakeholders to advance protection of groundwater resources through the development of policy and regulation that is based on sound science. The GWPC understands that the nation's water and energy needs are intertwined, and that the demand of both resources is increasing. We believe that smart energy policy will consider and minimize the impacts to water resources.

With respect to the protection of water resources, the Ground Water Protection Council recently published two reports of note that were referenced before. The first of these reports is called "Modern Shale Gas Development in the United States: A Primer." The Primer discusses the regulatory framework, policy issues and technical aspects of developing unconventional shale gas resources. As you know, there are numerous deep shale gas basins in the United States, which contain trillions of cubic feet of natural gas.

Recently, however there has been concern raised about the methods to tap these valuable resources. Technologies, such as the practice of hydraulic fracturing have been characterized as environmentally risky and inadequately regulated. The Primer is designed to provide accurate technical information to assist policymakers in the understanding of these issues.

In recent months, the states have become aware of press reports and websites alleging that six states have documented over 1,000 incidents of groundwater contamination resulting from the practice of hydraulic fracturing. Such reports are not accurate. Attached to my testimony are signed statements from state officials representing Ohio, Pennsylvania, New Mexico, Alabama and Texas, five of the six states responding to and refuting these allegations.

From the standpoint of the GWPC, the most critical issue is protection of water resources. As such, our goal is to ensure that oil and gas development is managed in a way that does not create unnecessary or unwarranted risk to water. As a state regulatory official, I can assure you that our regulations are focused on this task, and that leads me to the second report the GWPC has recently published entitled "State Oil and Gas Regulations Designed to Protect Water Resources." This report evaluates regulations implemented by state oil and gas agencies as they relate to the protection of water.

As a result of the review and analysis, the GWPC concluded that state oil and gas regulations are adequately designed to directly protect water resources. While state regulations are generally adequate, the GWPC report includes the following recommendations: First, the GWPC recommends that states, in conjunction with other stakeholders, should develop best management practices. A special concern would be involving the practice of hydraulic fracturing in close vertical proximity to underground sources of drinking water, as determined by the state regulatory authority.

Second, the GWPC recommends that the state review process conducted by the national non-profit organization STRONGER, be recognized as an effective tool in assessing the capability of state programs to properly manage exploration and production waste and in measuring the program improvement over time. The STRONGER process we believe should be expanded where appro-

priate to include state oil and gas programmatic elements that are currently not covered, including the practice of hydraulic fracturing.

STRONGER is currently convening a stakeholder workgroup to consider drafting guidelines for the state regulation of hydraulic fracturing. We also appreciate the funding assistance of United States Department of Energy and the ongoing efforts to develop data management systems that include more environmental and water-related data. In conclusion, Mr. Chairman and Members of the Committee, we believe that the state regulations are designed to provide a level of water protection that is needed to assure water resource viability and availability.

The GWPC will continue to assist the states in the implementation of effective regulations. Thank you.

[The prepared statement of Mr. Kell follows:]

**Statement of Scott Kell, President, Ground Water Protection Council**

Mr. Chairman, thank you for the opportunity to testify today. My name is Scott Kell. I am President of the Ground Water Protection Council (GWPC) and appear here today on its behalf. I am also Deputy Chief of the Ohio Department of Natural Resources Division of Mineral Resources Management. With me today are Mike Paque, Executive Director of the GWPC, Dave Bolin, Assistant Director of the Alabama Oil and Gas Board, and Lori Wrotenbery, Director of the Oklahoma Corporation Commission's Oil and Gas Conservation Division. Within our respective States, we are responsible for implementing the state regulations governing the exploration and development of oil and natural gas resources. First and foremost, we are resource protection professionals committed to stewardship of water resources in the exercise of our authority.

The GWPC is a non-profit association of state agencies responsible for environmental safeguards related to ground water. The members of the association consist of state ground water and underground injection control regulators. The GWPC provides a forum through which its state members work with federal scientists and regulators, environmental groups, industry, and other stakeholders to advance protection of ground water resources through development of policy and regulation that is based on sound science. I have included a list of the GWPC Board of Directors in our written submission.

The GWPC understands that our nation's water and energy needs are intertwined, and that demand for both resources is increasing. Smart energy policy will consider and minimize impacts to water resources.

With respect to the protection of water resources, the GWPC recently published two reports of note. The first of these reports is called Modern Shale Gas Development in the United States: A Primer (<http://www.gwpc.org/e-library/documents/general/Shale%20Gas%20Primer%202009.pdf>). The primer discusses the regulatory framework, policy issues, and technical aspects of developing unconventional shale gas resources. As you know, there are numerous deep shale gas basins in the United States, which contain trillions of cubic feet of natural gas. The environmentally responsible development of these resources is of critical importance to the energy security of the U.S. Recently, however, there has been concern raised about the methods used to tap these valuable resources. Technologies such as hydraulic fracturing have been characterized as being environmentally risky and inadequately regulated. The primer is designed to provide accurate technical information to assist policy makers in their understanding of these issues.

In recent months, the states have become aware of press reports and websites alleging that six states have documented over one thousand incidents of ground water contamination resulting from the practice of hydraulic fracturing. Such reports are not accurate. Attached to my testimony are signed statements from state officials representing Ohio, Pennsylvania, New Mexico, Alabama, and Texas, responding to these allegations.

From the standpoint of the GWPC, the most critical issue is protection of water resources. As such, our goal is to ensure that oil and gas development is managed in a way that does not create unnecessary and unwarranted risks to water. As a state regulatory official, I can assure you that our regulations are focused on this task. This leads me to the second report the GWPC has recently published.

This report, entitled State Oil and Gas Regulations Designed to Protect Water Resources, (<http://www.gwpc.org/e-library/documents/general/Oil%20and%20Gas%20Regulation%20Report%20Final%20with%20Cover%205-27-2009.pdf>) evaluates regulations implemented by state oil and gas regulatory agencies as they relate to the protection of water. To prepare this report, the GWPC reviewed the regulations of the twenty-seven states that, when combined, account for more than 99.8% of all the oil and natural gas extracted in the U.S. annually. To prepare this report, each state's regulatory requirements were studied with respect to their water protection capacity. The study evaluated regulated processes such as well drilling, construction, and plugging, above-ground storage tanks, pits and a number of other topics. The report also contains a statistical analysis of state regulations. As a result of our regulatory review and analysis, the GWPC concluded that state oil and gas regulations are adequately designed to directly protect water resources through the application of specific programmatic elements such as permitting, well construction, hydraulic fracturing, waste handling, and well plugging requirements. While State regulations are generally adequate, the GWPC report makes the following recommendations.

First, a study of effective hydraulic fracturing practices should be considered for the purpose of developing Best Management Practices (BMPs) that can be adjusted to fit the specific conditions of individual states. A one-size-fits-all federal program is not the most effective way to regulate in this area. BMPs related to hydraulic fracturing would assist states and operators in ensuring the safety of the practice. Of special concern are zones in close proximity to underground sources of drinking water, as determined by the state regulatory authority.

Second, the state review process conducted by the national non-profit organization State Review of Oil and Natural Gas Environmental Regulations (STRONGER) is an effective tool in assessing the capability of state programs to manage exploration and production waste and in measuring program improvement over time. This process should be expanded, where appropriate, to include state oil and gas programmatic elements not covered by the current state review guidelines. STRONGER is currently convening a stakeholder workgroup to consider drafting guidelines for state regulation of hydraulic fracturing.

Finally, the GWPC concludes that implementation and advancement of electronic data management systems has enhanced state regulatory capacity and focus. However, further work is needed in the areas of paper-to-digital data conversion and inclusion of more environmental, or water related data. States should continue to develop comprehensive electronic data management systems and incorporate widely scattered environmental data as expeditiously as possible. Federal agencies should provide financial assistance to states in these efforts.

In conclusion, Mr. Chairman and Committee Members, we believe that state regulations are designed to provide the level of water protection needed to assure water resources remain both viable and available. The states are continuously striving to improve both the regulatory language and the programmatic tools used to implement that language. In this regard, the GWPC will continue to assist states with their regulatory needs for the purpose of protecting water, our most vital natural resource.

Thank you.

[NOTE: Attachments have been retained in the Committee's official files.]

Mr. COSTA. Thank you very much, Mr. Kell. I will want to get back in the question areas about what you consider best management practices, but our next witness is Mr. Mike John, Vice President of the Corporate Development and Government Relations for the Eastern Division of the Chesapeake Energy Corporation.

**STATEMENT OF MIKE JOHN, VICE PRESIDENT OF CORPORATE DEVELOPMENT AND GOVERNMENT RELATIONS, EASTERN DIVISION, CHESAPEAKE ENERGY CORPORATION**

Mr. JOHN. Thank you, Mr. Chairman and Members of the Committee, for the opportunity to discuss the enormous economic and environmental potential of natural gas production from deep shale formations in the United States and around the world. I am Mike John, Vice President of Corporate Development for Chesapeake Energy Corporation.

peake Energy Corporation, the largest independent producer of and most active explorer for clean natural gas in the United States.

While our company is based in Oklahoma City, I am based in our West Virginia Office, which is focused on the development of what we believe may be one of the world's largest natural gas deposits—underlying parts of West Virginia, Pennsylvania, New York and other Appalachian states. This high potential play is called the Marcellus Shale. I would like to thank in particular some of the members of your Committee and Subcommittee from key areas for Chesapeake.

First, Committee Chairman, Nick Rahall, from my home State of West Virginia, Congressman Dan Boren from Oklahoma, Congressman John Fleming from Louisiana and the Louisiana portion of the Haynesville Shale, and Congressman Louie Gohmert from East Texas and the Texas portion of the Haynesville Shale. The topic of this hearing is very exciting because shale gas no longer just has potential. It is real, and it is a game-changer not only for America's natural gas industry but also potentially for our nation, our economy and our environment.

In fact, North America's natural gas supply is so plentiful it has been described recently by some experts as a virtual ocean of natural gas. As such, this shale gas revolution has made greater energy independence, enhanced national security and significantly cleaner environment attainable goals today. The real issue is no longer whether there is adequate supply, but rather whether there is adequate demand for this clean-burning domestically produced fuel to continue the development of these enormous resource plays.

In fact, Standard & Poor's analysts said earlier this week we have really got too much supply. Supply was up about seven percent in 2008 relative to 2007, and this is because the industry has finally been able to unlock some of the challenging unconventional resource plays. It is indeed an extraordinary time for our industry. Let me begin by providing some background on this highly successful company and industry leader that I proudly work for, Chesapeake Energy Corporation.

Chesapeake has grown from a startup just 20 years ago to become the largest explorer for and independent producer of natural gas in the nation. Today, Chesapeake has 94 rigs operating—80 percent, or 76 of these rigs, are operating in the big four shale plays. Amazingly, we are responsible for drilling of almost one out of every eight natural gas wells being drilled, and through the wells we participate in and other operated wells we collect an estimated 20 percent of all daily drilling information generated in the U.S. today.

To give Committee members a better sense of the scale of our operations currently, Chesapeake is responsible for more exploration activity in the United States than the five super majors, BP, Chevron, Conoco-Phillips, Exxon/Mobile and Shell, combined. The key to our success has been the application of cutting edge geoscience technology to discover new areas like the Haynesville, seismic and petrophysical analysis to define so-called sweet spots and refine drilling and completion design to enhance economic viability.

We then transfer all that knowledge internally to ensure maximum learning-curve benefits from other similar deep shale forma-

tions. We also have state-of-the-art technology and resources at Chesapeake that enable us to drill more accurately and precisely, including a reservoir technology center, which we can generate on-site core analysis, and we have our own 3-D seismic visualization center where we can display robust and vivid subsurface images making it possible for our geologists to pinpoint natural gas prospects miles below the surface.

We and other industry leaders have known for years about the existence of natural gas in deep shale formations. Unfortunately, we did not know how to economically extract the gas in commercial quantities from this very hard, non-porous and low-permeability sedimentary rock until recently, until the development of the Barnett Shale in the Dallas/Ft. Worth area of Texas. George Mitchell pioneered the Barnett Shale play starting in the 1980s after combining hydraulic fracturing and horizontal drilling techniques.

While natural gas prices rose off their historic lows, the play took off in 2003, and today it is the most prolific producing natural gas field in the country. I have included a map of the deep shale gas plays in your packet. You will see that the gas shale plays are located in various areas across the United States.

It is also interesting and telling to note that major and international companies like Exxon/Mobile, BP and StatoilHydro are recognizing the enormous potential of shale resource plays throughout North America and are starting to refocus their capital investment into the United States in the very same shale projects that we have introduced above.

We believe the potential from these four major shale basins is enormous and believe that depending upon price signals and supportive Federal policies that shale gas production could increase four-fold from an estimated seven to eight BCF per day in 2009 to a level approaching 30 BCF per day exclusively from these four major deep shale basins by 2020. Putting these production figures into context, they would provide 50 percent of all U.S. natural gas production from a source that was virtually non-existent 10 years ago.

With that, I will conclude my oral testimony, and I want to thank the Committee for holding this important hearing, and I look forward to answering any questions.

[The prepared statement of Mr. John follows:]

**Statement of Mike John, Vice President of Corporate Development & Government Relations, Chesapeake Energy Corporation**

Thank you Mr. Chairman and members of the Committee for the opportunity to discuss the enormous economic and environmental potential of natural gas production from deep shale formations in the United States and around the world. I am Mike John, vice president for Corporate Development and Government Relations for Chesapeake Energy Corporation, the largest independent producer of and most active explorer for clean natural gas in the United States. While our company is based in Oklahoma City, I am based in our West Virginia office, which is focused on the development of what we believe may be one of the world's largest natural gas deposits, underlying parts of West Virginia, Pennsylvania, New York, and other Appalachian states. This high-potential area is called the Marcellus Shale.

I would like to thank, in particular, some of the members of your subcommittee from key areas for Chesapeake—first, Committee Chairman Nick Rahall from my own West Virginia, Congressman Dan Boren from Oklahoma, Congressman John Fleming from Louisiana and the Louisiana portion of the Haynesville Shale and

Congressman Louie Gohmert from East Texas and the Texas portion of the Haynesville Shale.

The topic of this hearing is very exciting because shale gas no longer just has “potential.” It is real, and it is a game-changer not only for America’s natural gas industry but also potentially for our nation, our economy and our environment! In fact, North American natural gas supply is so plentiful it has been described recently by some experts as a virtual “ocean of natural gas. As such, this shale gas revolution has made greater energy independence, enhanced national security and a significantly cleaner environment, attainable goals today. The real issue is no longer whether there is adequate supply, but rather whether there is adequate demand for this clean-burning, domestically produced fuel to continue the development of these enormous resources bases.

In fact, Standard & Poor’s analysts said earlier this week, “We’ve really got too much supply. Supply was up about 7% in 2008 relative to 2007, and this is because the industry has finally been able to unlock some of these challenging unconventional resource plays.” It is indeed an extraordinary time in our industry.

First, let me begin by providing some background on this highly successful company and industry leader I proudly work for, Chesapeake Energy Corporation. Chesapeake has grown from a start-up just 20 years ago this year to become the largest explorer for and independent producer of U.S. natural gas in the nation. Today, Chesapeake has about 94 rigs currently operating—80 percent or 76 rigs of which are operating in the “Big 4” shale plays. Amazingly, we are responsible for the drilling of almost one out of every eight natural gas wells being drilled and, through the wells we participate in and other operated wells we collect an estimated 20 percent of all daily drilling information generated in the U.S. today. To give committee members a better sense for the scale of our operations currently, Chesapeake is responsible for more exploration activity in the United States than the five super majors BP, Chevron, ConocoPhillips, ExxonMobil and Shell combined.

We are even more proud that our company has emerged as America’s leader in high-potential deep shale gas exploration and production. Chesapeake had been one of the early entrants into the first two major deep shale basins, the Barnett Shale in north central Texas and the Fayetteville Shale in north central Arkansas. In 2008, our company proudly discovered the prolific Haynesville Shale in northwest Louisiana and east Texas in what has the potential to become the largest natural gas field in the United States. In addition, to those three major producing basins we are now ramping up our advanced technology shale drilling program in the Marcellus Shale in the Appalachian Basin.

The key to our success has been the application of cutting-edge geoscience technology to discover new areas like the Haynesville, seismic and petrophysical analysis to define so-called “sweet spots”, and refined drilling and completion design to enhance economic viability. We then transfer all that knowledge internally to ensure maximum learning curve benefits from other similar deep shale formations.

We also have state-of-the-art technology and resources at Chesapeake that enable us to drill more accurately and precisely, including a Reservoir Technology Center, where we can generate on-site core analysis, and we have our own 3-D seismic visualization center where we can display robust and vivid subsurface images, making it possible for our geologists to pinpoint natural gas prospects miles below the surface. Our company has an unparalleled inventory of more than 20 million acres of 3-D seismic data, as well as U.S. onshore leasehold of about 15 million acres. In short, we believe no single corporate entity has more knowledge about America’s subsurface as it relates to natural gas than Chesapeake. Additionally, it is important to note that over the past decade we have reinvested more than 100 percent of our operating cash flow back into producing domestic natural gas supply. It is independent producers such as Chesapeake that are leading the way in discovering and producing these new domestic and abundant sources of clean natural gas.

We and other industry leaders have known for years about the existence of natural gas in deep shale formations. Unfortunately, we did not know how to economically extract the gas in commercial quantities from this very hard, non-porous and low-permeability sedimentary rock.

And then along came the Barnett Shale in the Dallas-Fort Worth area of Texas.

George Mitchell pioneered the Barnett Shale play starting in the 1980s, but after combining hydraulic fracturing with horizontal drilling techniques while natural gas prices rose off their lows the play took off in 2003, and today, is the most prolific producing natural gas field in the country.

I have included a map of the major deep shale gas plays in your packet. You will see that shale gas is found across much of the United States, but primarily throughout the eastern, southern and west-central part of the country within major sedimentary basins. Chesapeake believes there are four major shale gas reservoirs

today—the Barnett Shale, the Fayetteville Shale in Arkansas, the Haynesville Shale in Louisiana and Texas, and the Marcellus Shale in the Appalachian region, including West Virginia, Pennsylvania and New York, as well as possibly parts of other contiguous states. We have either a top one or two position in each of these high-potential basins.

It is also interesting and telling to note that major and international companies like ExxonMobil, BP and StatOil Hydro are now recognizing the enormous potential of shale resource plays throughout North America, and are starting to refocus their capital investment into the United States in the very same shale projects we've introduced above. For instance, our company has major joint ventures with BP in the Fayetteville Shale in Arkansas and StatOil, a major international player based in Norway, in the Marcellus Shale.

We believe the potential from these four major shale basins is enormous and believe that, depending on price signals and supportive federal policies, that shale gas production could increase four-fold from an estimated 7 to 8 billion cubic feet (BCF) of gas per day in 2009 to a level approaching 30 BCF per day, exclusively from these four major deep shale basins in 2020. Putting these production figures in context they would provide virtually 50% of all U.S. natural gas production from a source that was virtually nonexistent in the past 10 years!

As mentioned, this shale gas production revolution is due to key well design and completion technique advances, primarily horizontal drilling and hydraulic fracturing.

First, horizontal drilling—while not a new process—has been greatly improved, and is the process of drilling vertically and then deviating the well bore at an “entry point” to drill horizontally, in some case to up to a mile away. Modern horizontal drilling can make a near 90-degree turn with the drillbit which allows much increased exposure of the drillbit to the “sweet spot” of a geologic formation and the ability to extract much greater quantities of natural gas than a vertical well. In addition, it provides a much more environmentally friendly technique because the number of surface locations is dramatically reduced, thus minimizing the surface footprint, which allows us to safely drill in urban areas such as Fort Worth, Texas, near Shreveport, Louisiana and in other well-populated areas where surface locations and surface disturbances want to be kept to a minimum.

Second, although somewhat controversial of late, hydraulic fracturing, or “fracking”, has been utilized since the 1940s but is now used on nearly all producing natural gas wells drilled today. Performed once a well has been drilled, this process creates fissures in very tight shale formations deep underground, many thousands of feet below the surface and fresh water aquifers. Water and sand and “proppants” are pumped down the well bore at high pressure to fracture the rock, so natural gas will flow into the wellbore. In addition to these primary elements a small percentage of other additives are used in fracturing fluids to protect target formations and increase recoveries. It is very important to reiterate that these deep shale formations exist thousands of feet below the land surface and are separated from fresh-water supplies by layers of steel casing, protected by concrete barriers as well as millions of tons of hard, dense solid rock geologic formations.

On that issue, which has been a subject of some concern to those not familiar with this industry practice, I have provided all members of the Committee in their packets with a copy of a fact sheet we use to inform and educate the public about hydraulic fracturing, including a list of common compounds found in fracturing fluids. Education is the key to addressing and allaying anxieties of all our stakeholders—including you—and we want to set a high standard for environmental stewardship and community protection.

In the end, very creative and hard-working scientists worked to “crack the code” to produce natural gas from the Barnett Shale, and fortunately, the process actually is becoming more “manufacturing” of natural gas than “exploring and producing” for it. In other words, this has become a safer, lower-risk, lower-cost process. Rapid progress can be made when you find great rock and apply great science to it.

Independent supply studies are confirming the results that industry is proving on the ground. The much acclaimed Navigant study, released in July 2008 reflects the great abundance of the North American supply resource base. This chart, which is in your packet, reflects that, even before the Haynesville and Marcellus is developed sufficiently to add their massive reserve content, that U.S. natural gas reserves are sufficient to provide approximately 120 years of reliable supplies at current production levels or can be scaled up dramatically with supportive federal policy.

Finally, another independent study to be issued later this month by the Colorado School of Mines' Potential Gas Committee is projected to show another significant growth spurt caused by new deep shale gas discoveries.

To conclude here, I want to acknowledge that the Energy Information Administration, or EIA, plays a major role in providing information about overall energy statistics and forecasts. They provide an invaluable resource. Historically, EIA's estimate of the overall U.S. natural gas resource has been consistent with the PGC study, arriving in 2006 at a resource base that would last 82 years at that year's production levels. However, EIA's forecasts of actual production have been consistently outdistanced by industry performance especially in the unconventional supply area.

Every year, from 1998 through 2008, EIA reflected the history of unconventional supply increasing on a very steep slope, with projections by EIA or a flattening of the supply curve. It has not done so. Instead between 2005 and 2008, we have added secure, onshore, domestic production of natural gas that exceeds the energy content of all the oil we import from Saudi Arabia. EIA is coming around—in their 2009 estimate, they show domestic unconventional supply at much higher levels, and show it displacing most of the imported liquefied natural gas (LNG) they used to think we would be relying on. We appreciate their recognition of our industry advancements.

It is also imperative that I share with this Committee that challenges exist for our industry and those who we must co-exist where we produce natural gas. As some of you know, today, we are drilling more frequently in non-traditional but potentially prolific environments, including challenging topographic environments and more urban settings.

In areas where there is a lack of infrastructure and an existing workforce, we complement experienced workers who are brought in from traditional producing areas with focused recruiting and training programs, and, as in our Fayetteville Shale training facility provide housing for employees. The success formula in all areas is consistent, import skilled and highly experienced workers while developing training programs to recruit local team members, and collaborate with local community leaders to develop best practices and procedures to minimize the temporary inconvenience caused by our drilling and completion operations.

The long-term benefits; high-quality job creation, royalty disbursements to mineral owners in the area, taxes paid on products and services purchased in the area and the creation of new businesses that provide services to our industry are all economic stimulators that provide a windfall profit in new resource rich areas.

These are all vital to being a responsible corporate citizen, and we take the responsibility very seriously and hold our operations to the highest standards.

To be even more specific, in today's challenging economy, it is instructive to quantify for the Committee the projected economic benefits and high-paying jobs provided by the natural gas industry. The average rig provides an estimated 80 direct and indirect jobs, as well as the aforesaid royalty payments, various tax payments, and infusion of significant capital investments in these key areas of exploration activity.

In fact, in two of the areas where deep shale drilling is currently being conducted, northwest Louisiana and east Texas, substantial economic development, significant tax revenues and high job creation is resulting from the current high-tech exploration boom. Similar job creation and royalty-payment disbursement is occurring today in Arkansas in the Fayetteville Shale as well. These two areas in particular have been shining stars in a otherwise very bleak economic picture throughout the country.

I am proud to say, as a native West Virginian, that I expect the next area to benefit from this intersection of capital, advanced technology, and natural gas reserve recovery will be here at home in Appalachia including West Virginia, Pennsylvania, and New York. In fact, as I mentioned previously it would not surprise me to see the Marcellus Shale underlying that area grow into the most prolific basin of all the four major shale basins.

And today, for you as policy makers, as Congress strives to deal with issues of climate change, national security and energy policy, now abundant, American, clean natural gas stands ready to be a low-carbon affordable answer that is scalable and ready to heed the call to reduce CO<sub>2</sub> emissions and respond to climate change concerns. Chesapeake and I believe natural gas is the right fuel, and today is the right time for its increased usage.

As many of you know, but I will reiterate here today, natural gas provides many environmental benefits to alternative fuels. Notably, as a fuel for natural gas vehicles (NGVs), natural gas emits approximately 30 percent less carbon dioxide and up to 90 percent fewer pollutants than gasoline. With gasoline prices beginning to escalate once again and our nation searching for a way to save our domestic automobile industry, we are excited to share with the Committee that natural gas can provide an immediate low-cost solution to higher gasoline prices and an environmental answer for America's large trucks, buses, and SUVs.



It would be appropriate for me right now to take this opportunity to thank chief co-sponsor Congressman Dan Boren, on the Committee today, who—along with Congressional leader John Larson—together have introduced important and supportive NGV legislation that has the potential to increase the domestic market for a cleaner, lower-emitting automobile. I am hopeful all of you on the committee today will consider supporting H.R. 1835 if you have not done so already.

In this country and around the world there is great debate about how to respond to global warming and the impact that greenhouse gas emissions have in increasing atmospheric temperatures around the world. I would be remiss if I did not remind the panel that a modern combined-cycle natural gas power plant is second only to a nuclear plant as the cleanest source of electrical generation. And the exciting new reality is that due to advanced drilling and completion technologies the U.S. has an enormous domestic natural gas resource base to support growth in existing power generation uses as well as use as a transportation fuel.

As I close today, I would like to advise the panel that with supportive federal policy, natural gas can help reduce OPEC's financial stranglehold on the United States, reduce the U.S. trade deficit and enhance national security. More than 98 percent of the natural gas we use in the United States is produced in North America—as opposed to the more than 65 percent of oil we import from foreign countries—and our natural gas distributed through a highly integrated pipeline network that delivers natural gas everyday to about 64 million U.S. homes and businesses. Furthermore, 33 states produce natural gas, broadly distributing the benefits of using this cleaner fuel.

While the coal industry has referred to the United States as the “Saudi Arabia of coal”, we believe the U.S. should now be referred to as the “Saudi Arabia of natural gas.” The new bottom line: The enormous natural gas resource base discoveries provide another, and in our mind the most attractive opportunities in decades to expand the use of this clean premium U.S. fuel in all arenas where the benefits of burning a cleaner, lower cost, dependable indigenous fuel can enhance the quality of life for all Americans.

Thank you, Mr. Chairman and members of the Committee, and I look forward to answering any questions.

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Mr. COSTA. Thank you very much, Mr. John, and we will look forward to the Q&A part as well. Our next witness is Mr. Lynn Helms, the Director of the Oil And Gas Division for the State of North Dakota Industrial Commission.

**STATEMENT OF LYNN HELMS, DIRECTOR, OIL AND GAS  
DIVISION, NORTH DAKOTA INDUSTRIAL COMMISSION**

Mr. HELMS. Good morning, Chairman Costa and Ranking Member Lamborn, other Members of the Committee. My name is Lynn Helms. As you heard, I am the Director of the Department of Mineral Resources for the Industrial Commission of the great State of North Dakota, and Earl Pomeroy said I should say it that way.

Mr. COSTA. Earl Pomeroy reminds us of that all the time.

Mr. HELMS. Very good. I am here today representing North Dakota and the 30-member states of the Interstate Oil and Gas Compact Commission who produce 99 percent of our domestic oil and gas. The mission of the IOGCC, which was formed in 1935, is two-fold: 1] to conserve our nation's oil and gas resources, and 2] to protect human health and the environment. Our current chairman is Governor Brad Henry of Oklahoma.

In my testimony today, I am going to begin with some information on the Bakken Shale in North Dakota and the energy it is providing to this country. I will also provide some testimony as to the competency and commitment of state oil and gas regulators for protecting our drinking water while developing our shale energy resources. First, I will talk about the Bakken. Because of the

Bakken, shale production in North Dakota now ranks No. 5 in the country in daily oil production.

These plays are truly game-changing resources. Bakken Formation extends from North Dakota into Montana, Saskatchewan and Manitoba. The Geological Survey stated in an April 2008 report it is the largest continuous resource they have ever assessed in the lower 48 states. It is expected to yield a remarkable 4 billion to 7 billion barrels of oil and 4 trillion to 7 trillion cubic feet of natural gas.

Technology will ultimately decide what is recovered, but current estimates equal all of our U.S. crude oil imports from the Persian Gulf since 2000 and a full-year of residential natural gas consumption for our entire nation. That is a lot of energy for our country, and a lot of jobs for American people. Now I want to address the issue of how the development of shale is regulated to protect and preserve water resources.

I will use a brief history of North Dakota's oil and gas regulation. Our original conservation law was enacted in 1911. It was updated in 1941, but then in 1953 when we joined the IOGCC, we updated it again to bring it into compliance with the model statute. Most states that produce oil and gas share a similar history. A critical part of every IOGCC meeting is what is called the Council of State Regulatory Officials.

It allows the top regulators in each state and province to share important emerging issues. For example, within weeks of a home explosion in Ohio, state regulatory officials were able to discuss the Ohio investigation and the cementing failure that caused it, and I can't compliment Mr. Kell and his people enough on their quick response and their accurate response.

As the head regulator of oil and natural gas in the State of North Dakota and an officer of IOGCC representing all oil and gas producing state regulators, I assure you we have no higher priority than protecting our state's water resources. I want to repeat no higher priority. Most of our regulatory framework is centered around measures to prevent any contamination of water resources. This includes hydraulic fracturing, which is thoroughly regulated by the states.

I have included in my packet a diagram of a typical Bakken well, and we can use it during questions if anyone has further interest. Studies and surveys by GWPC, EPA and IOGCC over the last 11 years have found no real credible threat to underground drinking water from hydraulic fracturing. It is a common operation used in North Dakota and all the member states of the IOGCC, and it is my firmly held view and also that of IOGCC that the subject of hydraulic fracturing is adequately regulated by the states, and it needs no further study.

The State of North Dakota and IOGCC are firmly committed to the premise that regulation of oil and gas activities is managed best at the state level. Regional and local conditions are understood there, and regulations can be tailored to fit the needs of the local environment. Even Federal regulatory programs have been most effective when they have been delegated to state regulatory agencies and funded through primacy programs, but regulations alone don't begin to provide the measure of a program.

The North Dakota Oil and Gas Division utilizes eight performance measures to continuously monitor our activities. Five of those measures are directly related to protecting water resources. These are backed up by a staff of field inspectors. They visit the wells weekly from the time the drilling rig moves in until the well head is installed and quarterly after that.

We participated in numerous groups whose purpose was best management practice and regulatory reviews, and these efforts have done a great job of documenting technology evolution, but they are snapshot views, not living documents that keep up. It is regular meetings of regulatory officials like our council of regulatory officials and the EPA task force that are most effective and the most effective way for regulators to keep pace with the rapid shifts in energy industry focus in real time.

Thank you for inviting me here this morning. I look forward to answering any questions that come my way.

[The prepared statement of Mr. Helms follows:]

**Statement of Lynn D. Helms, Director, Department of Mineral Resources,  
Industrial Commission, State of North Dakota**

Good morning Chairman Costa, Ranking Member Lamborn, and members of the Committee. My name is Lynn Helms. I am the Director of the Department of Mineral Resources of the Industrial Commission of the State of North Dakota. I am here today representing the Industrial Commission, the State of North Dakota, and other member states of the Interstate Oil and Gas Compact Commission (IOGCC) to express my views as a state regulator on development of shale gas in the United States and as to the outstanding job that states are doing in regulating the development of this most important national resource.

The 30 member states of the IOGCC are responsible for more than 99% of the oil and natural gas produced onshore in the United States. Formed by Governors in 1935, the IOGCC is a congressionally chartered interstate compact. The organization, the nation's leading advocate for conservation and wise development of domestic petroleum resources, includes 30 member and 8 associate states. The mission of the IOGCC is two-fold: to conserve our nation's oil and gas resources and to protect human health and the environment. Our current chairman is Governor Brad Henry of Oklahoma.

In my testimony today I propose to begin with some information on the Bakken shale formation in North Dakota and, how, thanks to recent technological advances, it is providing this country with an abundant and critical domestic energy resource. I will also provide testimony as to the competency and commitment of state oil and gas regulators to protect our states' drinking water resources in the development of the country's shale energy resources.

**North Dakota's Bakken Resource**

Let me begin by talking about the Bakken formation. I note that because of high crude oil prices in 2007 and 2008 and the discovery of new technology that has made it possible to economically produce the Bakken formation in North Dakota and Montana, the State of North Dakota has recently moved from the country's 9th ranked state in daily oil production to number 5.

The Bakken Formation is a large unconventional oil and gas resource that underlies most of western North Dakota, eastern Montana, southeast Saskatchewan, and southwest Manitoba. The U.S. Geological Survey (USGS) stated in an April 2008 report that it is the largest continuous resource they have assessed in the lower 48 states.

The upper and lower members of the Bakken formation are world class petroleum source rocks. Published estimates of Bakken oil generation potential range from 10 billion barrels (Dow 1974) to 300 billion barrels (Flannery and Krause 2006). The unpublished work of Price estimated the Bakken oil generation potential at up to 503 billion barrels. An extensive oil sampling program conducted by the North Dakota Geological Survey has shown that the Bakken is "truly dysfunctional" with no evidence that Bakken-generated oil has migrated away from the Bakken pool as previously thought. The geological models presented by Price (unpublished) and by Flannery and Kraus (2006) were based on input from North Dakota Geological

Survey geologists, samples from the North Dakota Core and Sample Library, and the well files from the North Dakota Oil and Gas Division establish the most likely range of oil and gas in-place estimates of 300-500 billion barrels of oil and 300-500 trillion cubic feet of associated natural gas.

This incredible resource was identified by geologists within months of the first commercial oil production in North Dakota in a well drilled on a farm north of Tioga, ND in 1951. Yet, economic production was rare until the remarkable technologies of the 21st century were brought to bear, including deep, long horizontal wells with multiple hydraulic fracture treatments. I might note that research funded by the U.S. Department of Energy (DOE) Office of Fossil Energy has helped advance these shale technologies, and I encourage strong Congressional support of the program.

Significantly, even after applying the latest tools available, the Bakken Formation is expected to yield only 1.4% of its original oil in place, which is still a remarkable 4-7 billion barrels of oil and 4-7 trillion cubic feet of natural gas. The Bakken play in North Dakota is still in the learning curve. North Dakota wells are still undergoing adjustments and modifications to the drilling and completion practices used for this formation. It is apparent that technology and the price of oil will dictate what is potentially recoverable from this formation. The current Bakken shale recovery estimate equals all U.S. crude oil imports from the Persian Gulf since 2000 and a full year of residential natural gas consumption for our nation. The proven portion of the middle Bakken member occupies over 8.4 million acres in western North Dakota. The current North Dakota drilling rig fleet is capable of developing 300,000 to 650,000 acres per year meaning full development could require 13 to 26 years and over 13,000 new wells each hydraulically fractured from 2 to 20 times. This is lot of energy for our country and jobs for the American economy.

#### **State Regulation of Oil and Natural Gas Development**

I'd like to now address the issue of how development of this shale resource in North Dakota, and throughout the country, is regulated so as to also protect and preserve our country's precious water resources. It is useful to understand the critical role that states play in the regulation of oil and natural gas resources in the United States. A history of oil and natural gas in North Dakota can serve as an illustrative example.

#### **North Dakota Oil and Gas Regulatory History**

In response to shallow natural gas discoveries used for domestic lighting and heating the North Dakota Legislature passed an oil and gas conservation law that prohibited production of gas unless it was tied to a distribution system in 1911. The 1941 Legislature later passed the first meaningful regulatory bill under the urging of then State Geologist Wilson M. Laird. As a result, North Dakota had an oil-conservation law in place when oil was discovered in the State ten years later, but following that first commercial oil production in April 1951 North Dakota saw the need to be part of the organization chartered by congress to assist states with oil and gas regulation. North Dakota joined the Interstate Oil Compact Commission in 1953 and the North Dakota Legislature revised the Oil and Gas Conservation Law to conform to the IOCC Model Act that same year. A Chief Petroleum Engineer was hired who immediately updated the rules to reflect the new law. Most states that produce oil and gas share a similar history and are also members of the IOGCC.

Every North Dakota Governor since 1987, around the time when North Dakota became one of the top 10 U.S. states in daily oil production, has chaired the organization.

The highlight of IOGCC meetings since 1988 has been the Council of State Regulatory Officials. At meetings of this group, the top oil and gas regulatory official of every member state and every oil and gas producing Canadian province, or their designee, shares with the group the top issues in their state or province. Recommendations from other states that have or are working with similar issues are frequently solicited. This forum allows state regulators to respond to new issues very quickly, consistently, and collaboratively. For example, within weeks of a recent home explosion in Ohio state regulatory officials were discussing the investigation by the Ohio Department of Natural Resources and the primary cementing failure that caused it. Another example of the efficacy of such a program is the frequent updates on the LEAF lawsuit and group discussions of the issues surrounding hydraulic fracturing in the United States that ensued.

When I began this job almost eleven years ago the relationship between the North Dakota Oil and Gas Division and other state and federal agencies whose jurisdiction overlapped in many areas was very mixed. Realizing that relationships change as do agency directors we moved aggressively to develop Memoranda of Agreement

with those agencies that provide structure for both the regulators and regulated community and provide for period review and change. A national example of this is a Memorandum between the IOGCC and the U.S. Environmental Protection Agency (EPA) which provides for a process under which states and EPA regularly meet as environmental co-regulators.

#### **Regulation to Protect Water Resources**

As the head regulator of oil and natural gas development in the State of North Dakota and an officer of the IOGCC representing all oil and natural gas producing state regulators, I can assure you that we have no higher priority than the protection of our states' water resources—let me repeat no higher priority. Much of our entire regulatory framework, from drilling to completion, production, and finally plugging and abandonment, is centered around measures to prevent any contamination of the water resource. As a component of the completion of a well, hydraulic fracturing operations are thus thoroughly regulated and supervised by the states.

A major component of production operations is the proper storage and disposal of all production wastes, including hydraulic fracturing flow back water. These operations are carefully monitored, audited, and regulated in our state programs.

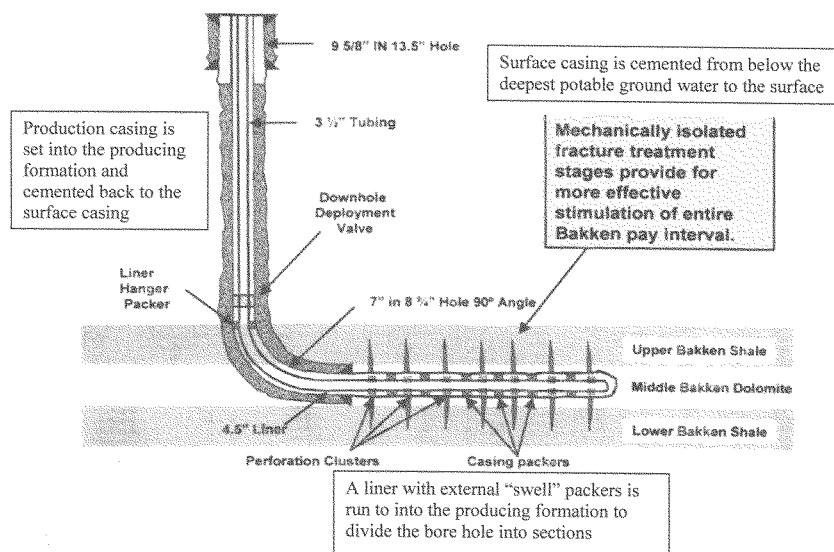
As I noted in my testimony above, hydraulic fracturing is a critical component of developing the Bakken formation, indeed every shale play throughout the U.S. and Canada. Without hydraulic fracturing, under regulation of the states, this resource could not be produced.

I have included both a picture of a hydraulic fracture treatment near Lake Sakakawea in North Dakota (page 5) and a diagram of a typical Bakken formation well (page 6) that shows how it is that water resources are protected during the oil and natural gas production operations, including hydraulic fracturing.

#### **ND hydraulic fracture treatment:**



### ND Bakken shale well bore:



### Hydraulic Fracturing Is Environmentally Safe

In a 1998 survey of state oil and gas regulatory agencies, conducted by the GWPC, twenty four state programs said they had not recorded any complaints of contamination to a USDW that the agency could attribute to hydraulic fracturing of coalbed methane zones.

In 2004 the Environmental Protection Agency published a final report summarizing a study to evaluate the potential threat to underground sources of drinking water from hydraulic fracturing of coal bed methane production wells and the Environmental Protection Agency concluded that "additional or further study is not warranted at this time..." and that "the injection of hydraulic fracturing fluids into coal bed methane wells poses minimal threat to the underground sources of drinking water".

Subsequently, the IOGCC conducted a survey of North Dakota and other oil and gas-producing states that found that there were no known cases of ground water contamination associated with hydraulic fracturing. Hydraulic fracturing is a common operation used in exploration and production by the oil and gas industry in North Dakota and all the member states of the IOGCC. Approximately 35,000 wells are hydraulically fractured annually in the United States, and close to one million wells have been hydraulically fractured in the United States since the technique's inception, with no known harm to ground water.

It is my firmly held view and that of the IOGCC that the subject of hydraulic fracturing is adequately regulated by the states and needs no further study. In my opinion too frequent nationwide or federal study and review of critical operations like hydraulic fracturing, underground injection, and RCRA class II waste exemptions create an environment of uncertainty and litigation that inhibits real progress in sustainable resources development.

Complaints of ground water contamination attributed to hydraulic fracturing or any other oil and gas operation should continue to be investigated by the appropriate state agency or agencies to determine whether or not ground water has been affected and whether a cause and effect relationship can be established between any impacts to ground water and petroleum exploration and production activities.

### Summary

The State of North Dakota and the IOGCC are firmly committed to the premise that regulation of oil and gas field activities is managed best at the state level where regional and local conditions are understood and where regulations can be

tailored to fit the needs of the local environment. Federal regulatory programs have been most effective when they have been delegated to state regulatory agencies and funded through primacy programs. The primary example of this success has been the 1974 Safe Drinking Water Act (SDWA) section called the Underground Injection Control (UIC) Program. Between 1982 and 1990, twenty oil producing states applied for and received primary enforcement authority (primacy) from EPA to administer the program under Section 1425 of SDWA. Delegation of authority for this program to the states has required those with oil and gas regulatory programs to demonstrate that their programs were equally effective in protecting ground water as those promulgated and administered by EPA under Section 1422 of SDWA. Federal regulatory programs that cannot be delegated to state regulatory agencies and funded through primacy programs have been a constant source of friction between regulators and it has been much more difficult to achieve compliance. The primary example of this success has been the 1990 Oil Pollution Act (OPA) and Spill Prevention Control and Countermeasure (SPCC) regulations.

**Regulations alone don't begin to provide the full measure of a regulatory program. The North Dakota Oil and Gas Division of the Department of Mineral Resources utilizes 8 performance measures to monitor our activity in the areas of drilling permitting, UIC permitting, wellbore construction, well bore mechanical integrity testing, spill containment and clean up, fluid measurement, oil and gas conservation, and customer satisfaction. At least five of these measures are directly related to protection of water resources. These performance measures are backed up by a staff of field inspectors who visit the wells every day from when the drilling rig moves in until the permanent wellhead is installed and at least quarterly after that.**

North Dakota has participated in numerous work groups whose purpose was the development of Best Management Practices (BMPs) and regulatory review processes. While these efforts have done a great job of documenting the evolution of technology used to address and mitigate problems real or imagined they result in snap shot views of BMP or regulatory practices at a point in time and they do not result in living documents that keep up with the industry. For example, North Dakota participated in a deep unconventional natural gas BMP work group, which finished its work just as industry focus shifted to coal bed methane, sparking another BMP work group which again finished its work just as industry focus shifted to unconventional oil and gas shale utilizing horizontal drilling and hydraulic fracturing.

**Regular meetings of regulatory officials such as the IOGCC's Council of Regulatory Officials and EPA Task Force are the most effective way for regulators to keep pace with the rapid shifts in energy industry focus in real time.**

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Mr. COSTA. Thank you very much. Our last witness rounding up this panel is Mr. Albert Appleton, an Infrastructure and Environmental Consultant, and as I noted earlier, the former Director of the New York City Water and Sewer System, which would open up a whole other possibility of questions, but that is not the subject of this morning's hearing.

**STATEMENT OF ALBERT F. APPLETON, INFRASTRUCTURE AND ENVIRONMENTAL CONSULTANT, FORMER DIRECTOR OF THE NEW YORK CITY WATER AND SEWER SYSTEM**

Mr. APPLETON. I have been before this Committee for those questions before. Thank you, Mr. Chairman. I am partially here not only because of that connection, but because of the work we did in the early 1990s in creating the New York City Watershed Program, which is a global poster child for the use of non-regulatory measures to deal with broad landscape and water programs.

I would like to acknowledge before I go on being before again Congressman Hinchey, whose advice and support during that time played a critical role at a time when most of the political structure was against this kind of environmental innovation.

There are two sets of questions here. Nobody is disputing that natural gas is a good fuel, and nobody is disputing that if you can

back out more polluting fuels, that is a good idea. The question is whether or not the cost of extracting this gas economically and environmentally is worth the particular benefits, and that is an issue particularly raised by hydrofracking as it goes to replace more traditional methods of natural gas extraction. Now, the industry says that essentially it is putting more regulation on that. Regulation that actually already exists for every other industry is something they can't afford.

Yet, at the same time as the industry touts the enormous benefits of this, in New York it is projected an increase in governmental revenues of \$1 billion annually, it is talking about huge kinds of cash flows, so the idea that the industry could not afford to comply with this housekeeping does not even pass the most rudimentary tests of due diligence. Now, why is hydrofracking raising such concerns? The concerns are raised by a particular characteristic of that, which is the materials used for hydrofracking, the purpose of which is laid out in my testimony, don't biodegrade.

Once they are in the environment, they are in the environment to stay. We have learned through long and bitter experience that the only way to protect the environment from these kinds of materials is to keep them out of it. Now, as my testimony lays out, there are three paths to these materials:

There is the deep injection of them. There are surface spills, and there is the disposal of waste material. These all present very serious and pernicious threats to the environment. They can be controlled. This is not the question. The question is will they be controlled? There has been a great deal of talk here about regulatory structures. There has been far too little talk about the problem of enforcing an industry that is building hundreds of thousands of wells or at least hopes to and projects that it will do so.

When we did the New York City Watershed Protection Program that covered an area of the size of Delaware to do it right took 400 new people. With all due deference to my colleagues, particularly from North Dakota, which is in the Appleton home state, regulatory staffs in the United States do not begin to cover the need to do this. Again, this is a topic we could spend a lot of time on, but I am trying to be good. I know how important Chairman are shall we say.

There are a couple of other issues that have been raised. Water withdrawal has raised an issue. Water withdrawal can be overstated in issue as it is managed right, but water withdrawal in areas that have small streams or seasonal streams or streams that are being used for disposal is an altogether different question. Then, there are the questions of air pollution. There is the question of social impact on these.

These include 24-hour drilling operations, notice odor, light pollution, road congestion, the degradation of property values for people who have not leased their areas adjacent stream, disruption of local rural economies and disruption of traditional agricultural opportunities. There is a way to deal with these questions. It is called zoning. Zoning is designed to keep industrial activities away from incompatible uses. We don't have that kind of zoning in most rural areas.



Now, many will argue that these problems are overstated, but if just two percent of these hundreds of thousands of wells go south in some way or another, that is thousands upon thousands of incidents, and I invite questions about that. In my remaining time, I want to focus quickly on two things about long-term energy policy. The first is we are spending as a society, state and nationally, billions of dollars in hopes of building a green energy economy, but who does that green energy economy compete with?

It competes with traditional fuels, including natural gas, that generates half of the electricity in the country already. If we subsidize natural gas production by allowing the externalization of environmental cost, we are essentially undercutting our own green investment policy. The other question, which I would say in closing, is global warming seems to be left completely out of this picture.

I am fascinated when I read the Economist each week. Here we have a very detailed, three-page analysis of global warming, and then six pages later they will talk about the new play and offshore Brazilian oil as if global warming is going to have no impact on future hydrocarbon demand. It will. That is, future hydrocarbon demand has got to go down if we are going to address this problem, and that means in the future we must focus on those sources that are most sustainable.

My time has expired. I appreciate your patience for the extra 30 seconds. I would be delighted to answer questions.

[The prepared statement of Mr. Appleton follows:]

**Statement of Albert F. Appleton, Infrastructure and  
Environmental Consultant**

Good Morning, Mr. Chairman, Committee Member

I am honored to appear before this Subcommittee to testify on this issue. At one level, the issue the Committee is addressing appears simple, what is the appropriate level of environmental regulation. But to address the potential of shale gas and, indeed, the other unconventional fuels the Subcommittee will be reviewing requires a rigorous approach to the underlying economics of this issue. I hope this testimony will assist the subcommittee in doing so.

Should shale gas drilling be subject to the normal requirements of good environmental housekeeping? The industry argues that this would be "overregulation" and that it would economically undermine the future of shale gas extraction. Yet at the same time, when touting shale gas, the industry promises annual revenues of many billions of dollars to state governments and local landowners, and describes shale gas as an asset ultimately worth trillions. With projected cash flows of these levels, the claim that the natural gas industry cannot afford the costs of meeting basic environmental housekeeping standards, costs every other American industry, most of whom are far less profitable than shale based natural gas, routinely pay, is not a claim that survives even the most rudimentary due diligence.

The industry also argues that shale gas extraction is environmentally safe. This is also a claim that challenges basic common sense. Shale gas extraction is dependent on hydraulic fracturing; also known as fracking, a process of using high pressure injection of sand in water to fracture the shale formations and release the natural gas trapped in the shale. But sand added to water merely sinks to the bottom. What must also be added is some liquid with the same specific gravity as sand to hold the sand in solution so that it can exert its fracturing force. As has been widely documented, these fracking fluids use a witches brew of toxic chemicals, nearly all of which are intrinsically hazardous to the environment.

Why are they so intrinsically hazardous to the environment? The answer is simple: these compounds do not biodegrade. Once in the environment, they stay in the environment. Most of them bioaccumulate. The remainder volatilize, removing them from water and land, but adding them to the atmosphere where they become contributors to global warming. The only way to protect the environment, and particularly water resources, is to prevent their introduction into the environment. Streams have no capacity to absorb these compounds; dilution is the only solution for their

pollution. And because these compounds are toxic in such minute amounts, streams very quickly reached their capacity to safely dilute such compounds.

So how does fracking introduce these compounds into the environment? There are three ways.

First, fracking leaves a significant portion of the fracking fluid underground, where it is free to migrate into groundwater. The industry argues that fracking, particularly in the East, takes place at depths so far below aquifer layers that fracking presents no threat to underground water resources. Unfortunately, there are three qualifications to that reassuring conclusion. The first is that currently there is no standard based assessment of the underground hydrology required before a site is chosen for fracking. So what one has, in effect, is underground injection of wastes without any the safeguards of permitted underground injection.

The second qualification is that the industry position assumes that, as the concrete casing is drilled through the water bearing strata, it is properly drilled and maintained so its integrity is not breached, allowing fracking materials to pollute the water. To insure this, far more oversight of the drilling process is needed than takes place now.

And the third qualification is time. Fracking material may not invade aquifers immediately; it is a process that could take decades. But because those materials do not biodegrade, if they can move towards water sooner or later they will get there. And then what? The issue of delayed damages is one that has drawn almost no attention, but it is one that thirty years from now those dependent on aquifer water could passionately and bitterly care about. Time is also the enemy of concrete, yet the requirements for maintaining concrete drilling casings, particularly once a well has ceased to produce, have yet to adequately address the question of long-term casing integrity.

The second way fracking materials can enter the environment, particularly the water environment, is through surface spills. There are three sources of such spills, unplanned irruption of underground liquids, including fracking materials, to the surface; poor housekeeping; and surface floods. Fracking liquids, and the materials for them, are typically stored in open lagoons, a practice that should end in favor of off the ground, corrosion proof tanks. It should be remembered that so far shale gas extraction has operated largely on the flat, arid, sparsely populated, often publicly owned lands in the West. As shale gas extraction moves into the hilly, rainfall abundant, densely populated and privately owned East, only proper regulation and a far different standard of care can avoid an inevitable disaster.

One of the key elements of those regulations must be stormwater management, an issue that in many jurisdictions is avoided by keeping the size of the actual drilling pad to less than five acres and is exacerbated by the Clean Water Act exemptions from stormwater permitting for oil and gas production.

The third way fracking materials can enter into the environment is through the disposal of used fracking liquids. Though a significant portion of fracking material will remain underground, an even larger portion returns to the surface presenting critical problems of waste disposal. The industry has done everything from spreading these liquids on the road as deicers, to depositing them in streams, to putting them through normal sewage treatment plants. None of these are acceptable practices. The enormous loophole for oil and gas waste in the Resource Conservation and Recovery Act (RCRA) needs to be replaced by a positive program that insures fracking materials will receive proper disposal.

The path that needs to be taken is to put waste fracking materials through an industrial strength hazardous materials treatment facility and then to properly dispose of them through a properly and strictly enforced program of planned and hydrologically safe underground injection. Though many advocate allowing discharge of hazardous material treated effluent into streams under carefully controlled limits, any disposal of treated fracking liquids in streams needs the most careful study. It must be banned in any areas that are used for water supply purposes because of the threat of bioaccumulation. Even in other areas, conclusions that treated fracking fluid can be disposed of in surface waters run the peril of misleading the industry as to how much dilution capacity a surface stream has and inducing it to depend on a resource whose limits they will soon exceed.

Though the pollution problems of fracking materials have attracted the bulk of attention with respect to shale gas extraction, they are by no means the only environmental issues that fracking raises. There is air pollution, from a combination of using diesel powered equipment, an enormous volume of drilling related truck traffic and the venting to the atmosphere of a number of gases, including methane.

Then there is the question of where will the shale gas industry get the water for the fracking process? Even if one uses the industry numbers for the amount of wells that will be drilled, in absolute terms the amount of water fracking will need is not

outlandish. But that conclusion scants some critical complexities in terms of local impacts. First, the volume of water needed for a single fracking event, two to ten million gallons, can have a huge impact on local tributary streams. Second, the timing of such withdrawals can be critical in terms of issues should as fish spawning and maintaining the natural annual pulsing of stream flows to which the stream ecology is adapted. Third, water withdrawals that could be acceptable in wet years may not be acceptable in dry ones. Fourth, if the industry shifts to groundwater use, those withdrawals could have significant effects on groundwater aquifers that are providing base flows for surface streams. And finally, water withdrawals from any stream that is receiving discharges of treated fracking fluids must be coordinated with discharge planning so that the reduction in the dilution capacity of the stream is reflected in the amount of discharge allowed.

If water withdrawal for fracking purposes by natural gas drillers is to proceed in an orderly and ecologically responsible manner, a proper regulatory and planning framework needs to be created.

Here a pause to take note of industry claims that state regulation will be sufficient is particularly appropriate. Both the issues of discharge of treated fracking fluid waste, and the issue of water withdrawals are not just local ones. Many streams traverse more than one state making common rules for interstate situations essential if development is to proceed in an orderly manner and if a race to the bottom to avoid the requirements of good environmental housekeeping is not to be created.

Two other issues of environmental impact and cost externalization will complete the immediate inventory of concerns for this subcommittee should be most aware of. The first is the impact of fracking on the rural landscape, particularly in areas that support water resources. These impacts are both ecological and social. Ecologically, five acre drilling pads, surrounded by a larger leased area degraded by drilling support and combined with new pipeline corridors and new or expanded roads mean a landscape transformed from rural to industrial.

Then there are the social impacts of such drilling. These include 24 hour drilling operations, problems of noise, odor, light pollution, greatly increased volumes of truck traffic and road congestion, potential health impacts from the toxic chemicals that fracking operations put into the environment, and the disruption of well based rural water supplies. The landscape transformations from the new shale gas economy undermine rural businesses in tourism, depress the property values of those adjacent to well sites whose property was not leased for oil and gas drilling, and are often incompatible with traditional agricultural business activity.

Many will argue about the level of these problems, dismissing them as few isolated instances, but consider the numbers. Even if only 2% of proposed drilling sites generate some significant adverse impact, on the basis of industry projections of 120,000 drill sites for Pennsylvania and New York alone that would create 2,400 instances of significant impacts. Given shortages of an experienced labor force and a historical culture that has emphasized production over environmental housekeeping, if the industry expands at the rate the industry projects, one could reasonably expect to see a glitch percentage closer to 5%, or 6,000 adverse impacts in New York and Pennsylvania alone.

All of which points to three conclusions. First, shale gas drilling is completely inappropriate in any area that is a major drinking water source, such as the New York City watershed, the Delaware River Basin, and recharge areas for sole source aquifers.

Second, the above panoply of landscape and social problems can only be addressed by one tool, zoning, which most rural areas currently lack. Such zoning, designed as all zoning is, to minimize the impacts of incompatible uses being placed adjacent to each other, is essential not only to minimize harm to existing countryside residents from fracking, but to maintaining over the long term, public support for the use of fracking technology.

Finally, it seems clear that a system of impact payments to local rural governments will be needed, to deal with issues like congested road systems, facilities for workforces, adverse impacts on traditional outdoor recreational resources, improvements in utility systems and schools and so forth.

In closing this section of my presentation, a word must be said about enforcement, which must be the companion of any restoration of the environmental standards of the Clean Water Act, Safe Drinking Water Act, and of the other new environmental regulations needed to address the above issues.

The Department of Energy's report on Comparative Gas regulation identifies eight separate tasks involved with shale gas regulation. Moreover, because prevention is the only viable strategy for many of these issues, and because of the intrinsic difficulty in monitoring underground activity, it is clear that frequent site visits, a

number of which should be unannounced, will be required, not to mention that there are a number of tasks such as supervising concrete work on drilling casings that should be independently supervised and reviewed by regulators at the time they are carried out.

Taking New York as an example, the industry currently projects 40,000 wells will be drilled in the State. If half that number, 20,000 wells are active at any one time, then New York State regulators need a staff adequate to oversee 20,000 wells. Though to offer any precise number of additional regulators that New York will need would depend on too many assumptions to be done casually, it is clear that an adequate regulatory oversight staff for fracking will number in the many hundreds if not larger. When the New York City watershed program was created, it required 400 new staff to cover an area a tenth of the size of area of the Marcellus and to manage what was ultimately a less complicated environmental oversight task.

Addressing these issues must be the foundation of any successful long-term policy towards extraction of shale natural gas. Yet ideally, this would only be the beginning.

The current debate over shale gas extraction is based on an industry approach that assumes the environment is, in economic terms, a cost center, and that the policy issue is to find a balance point where economic activity can be maximized and the costs of environmental compliance minimized. But this is essentially what should be called, for lack of a better term, the old accounting, in which industry tries, by minimizing its environmental obligations, to externalize as many costs as possible and, by externalizing them, to maximize its profits.

But as a society, what we have increasingly come to recognize is that we want a new accounting, the accounting of sustainability, where the environment is not seen as a cost center to be avoided to the greatest extent possible, but as a profit center, where environmental stewardship becomes the key to a smooth functioning, profitable industry that maximizes overall public wealth.

The problem with the old accounting is that, while it makes money for some, it costs money for many more. Externalizing costs is, in any free market economy, intrinsically inefficient. It is a form of corporate welfare performed at the expense of all those who must pay the externalized costs, costs that in any full cost accounting system generally wind up being far greater than the sum of the benefits that come from doing so. For example, the natural gas industry projects New York State will receive a billion dollars in additional revenue from shale gas development. However, if such development were to undermine water quality in the New York City watershed, as it undoubtedly would, the cost of building and operating filtration works would be at least 1.2 billion dollars a year. Extend these impacts throughout the state and we have an industry whose profits would depend on an inaction subsidy from New York State's government and the costs paid by state residents would be far in excess of what it would produce for them.

There is an even more fundamental flaw, one that applies nationally, with allowing the shale gas industry to externalize its costs through a lack of environmental regulation or effective enforcement of applicable environmental regulations. The country has made a historical commitment to a green energy economy at all levels of government. Again using New York as an example, electrical power customers in New York State are paying enormous sums as surcharges on their electrical bills to support green energy.

But whom does green energy compete with as a source of electricity? It competes with natural gas powered electrical generation. If the price of natural gas is kept artificially low by government's failure to prevent the externalization of the costs of fracking produced natural gas, then government is undercutting its own green energy policy. The great economist Milton Friedman once did a famed interview where he stood on the D.C. Mall and pointed first to the Department of Agriculture saying, over there well meaning people spend billions of dollars encouraging the growth of tobacco. Then, pointing to the Department of Health and Human Services, he said, and over there equally well meaning people spend billions to fight the health consequences of using tobacco. One of these sets of people, he concluded, is wrong.

If Dr. Friedman were alive today, he would undoubtedly look at our policy of sponsoring green energy while allowing the subsidization of lower prices for its natural gas competitor by externalizing its environmental costs of production, and conclude the same thing. Until we make coal, natural gas and oil production sustainable, we will continue to face that dilemma.

Sustainable is the key word. The basic premise of sustainability is that the environment is a profit center, not a cost center, and that the integration of economic development with environmental stewardship is the way to maximize individual and

social profit. This is the challenge that the natural gas industry, with its resistance to the ordinary standards of environmental housekeeping that every other major American industry complies with, is notably failing to address. In clinging to the old accounting of the past, instead of the new sustainable accounting of the future, it is the shale gas industry that is generating the opposition to its use of fracking and is feeding rapidly escalating political controversy. In orienting the shale gas energy industry towards the past, instead of the future, the Cheney Energy Amendments of 2005 did the industry no favor. The industry should be seeking to make shale gas extraction as sustainable and as green that its advertising and public pronouncements, as its slogan of clean burning natural gas, implies.

What, briefly, would that sustainable policy look like? It would end the externalization of environmental costs by raising the standards of industry practice. It would develop non-toxic and biodegradable fracking additives. It would recognize that there are critical areas, watersheds, special scenic resources, critical resources for the local economy and densely populated areas that need to be off limits for any drilling. And it would work closely with local stakeholders to develop local zoning and regional planning schemes to avoid disastrous social impacts.

So, in the context of this hearing, how important is shale gas extraction going to be for America's energy future. Unless the industry embraces sustainability, the answer is going to be not very. For the last chapter is the drama of green energy versus traditional energy is going to belong to global warming.

We are at an interesting point in political and economic time. The country and much of the world has embraced the idea of a green energy future. But we have not yet faced the full implications of what that means for the existing energy industry.

The basic reality is that over whatever time period we choose to target, total carbon combustion is going to have to drop dramatically, if we are going to avoid the multi-trillion dollars costs of global warming that we are already beginning to experience. Transitions produce these kinds of gaps in understanding. Few things can produce more of a sense of economic unreality than to read in a business publication like the Economist a rigorous assessment of the prospects for global warming and then find five pages later an article on the new oil play in the Arctic Ocean or in deepwater off Brazil that totally ignores the impact of global warming policy on hydrocarbon demand and the on the stunted economic return likely on the tens of billions that will have to be invested to recover these resources.

With respect to global warming, once the emissions implications of current economic growth in just the four CRIB countries, the numbers are inexorable. A vast reduction in carbon combustion and a massive increase in green energy production is the only future that has any choice of being sustainable.

Over the next ten years, it will become ever more apparent that the existing hydrocarbon based energy industry will be playing a game of last man standing in which the prize will go to the industry or the components of particular industries that are more efficient and more sustainable. The billions and billions of dollars involved in extracting and using the unconventional resources this committee is reviewing, these additional billions in externalized environmental costs that have so far accompanied such developments, will not be paid by a public that is struggling with both the costs of transitioning to a green economy and with the steadily accelerating costs of unprecedented climate change.

So far, the only industry that seems to recognize this fact, even if the recognition has been somewhat begrudging and incomplete, has been the coal industry. Perhaps because it has not been sheltered, as shale gas extraction has been, from the upsurge of public opposition to unsustainable energy generation, the industry is now developing a serious commitment to clean coal and trying to make deep subsurface CO2 injection work. It is far too early to assess whether they will be successful in these efforts, but the fact they are starting to face their future in this manner is a welcome development. The shale gas industry needs a similar epiphany if it is not to energy a brief burst of publicly subsidized splendor followed by a decline that leaves much of the American countryside an industrialized sacrifice zone.

Hopefully, the work of this Committee will represent a starting point in that effort.

Thank You.

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Mr. COSTA. Thank you very much. We are now at the part that I always like best, which gives Members an opportunity to ask questions of the witnesses, and I will begin. All of you have spoken in some degree about the sense of the potential for shale gas as a

major part of the energy portfolio that I spoke of earlier. Beginning with Mr. John, would you please describe to me what you think are the chief obstacles in capitalizing on shale gas as a significant portion of this energy portfolio in the country?

Mr. JOHN. Gladly, sir. I would first characterize just the size of the resource plays, the big four shale plays.

Mr. COSTA. Speak closer into the mic. We do want to hear you.

Mr. JOHN. I appreciate that. Hopefully, that is better. I would first want to just emphasize the size of the four shale plays that we have been talking about are enormous, and I think the science that has gone into the stimulation and the horizontal drilling technique so far, it has advanced to the point that we as an industry are confident that we are poised to develop these large plays.

My basic answer to your question would be our biggest concern would be that there wouldn't be any negative changes in the environment ahead of us, the regulatory environment that would preclude us or hinder us from going forward with the development of the plays. We believe that we have the technology now to develop these plays. We believe we have the resources in place to make it happen, and we would be concerned that there would not be any regulatory changes that might impede the development of that resource.

Mr. COSTA. Well, that is a very broad description of obstacles, regulatory change. It seems to me, and I want to get to Mr. Kell when we talk about best management practices, there ought to be a discussion going into it as to whether or not we want to establish some level of uniformity among states. I am originally from a state legislature, so I tend to favor state regulatory framework, but I think there needs to be some uniformity, and especially given the fact that a lot of these plays are intra-state in terms of the areas that they cover.

In other words, they cover multiple states, and it seems to me that providing a level playing field in that instance is important. Mr. Kell, what do you see as the major obstacles, and you noted best practices. Is there a gold standard as it relates to best management practices? If there is, where does that gold standard lie? Where would you point to that would create uniformity maybe around the country?

Mr. KELL. Yes. Mr. Chairman, in my testimony, I commented on two different processes that help address regulatory practices within the states with the recognition that geologic conditions, industry practices vary from state to state. But with regard to that lowest common denominator—those elements that ought to be embodied, incorporated in all state programs—I advocate the stronger review process as a process that was established to help bring about more uniformity and consistency in the way states regulate and manage oil field waste and ensure protection of the environment and public health and safety in that process. The STRONGER process has been a proven success. There have been 21 states that have voluntarily undergone the STRONGER review. Ten of those states have gone followup reviews, including Ohio.

We take very seriously the recommendations of the STRONGER review and value their assessment of our program relative to the guidelines.

Mr. COSTA. Yes. I don't know if you have it in your other information, but submitting that information as to best management practices among the states, I'd like to look at it. There is also noted, and maybe you are the person who asked the question about the impacts on water quality, and certainly I think we should all be concerned about that. The gentleman from New York noted that in his testimony. I would like to get back to him on that, but I am also concerned about water quantity.

I mean, if you are east of the Mississippi River, as witnessed yesterday, last night and today water is everywhere, but if you live where I do, and you are in the middle of a drought, the quantity of the water becomes another issue. Is the impact on the availability of the extraction of that water and the potential depletion of aquifers an issue?

Mr. KELL. It can be an issue, and I would recognize that as an excellent topic to be addressed through stakeholder driven preparation of best management practices. Being from Ohio, which is a state that borders the Marcellus play but has yet had very limited development, I look with interest across our border to Pennsylvania and West Virginia as state regulatory offices among several agencies wrestle with how do we effectively manage the larger volume withdrawals in a way that does not diminish water quantity or quality, and we are hearing stories from a variety of states.

Some of those are referenced and documented in the Primer about some of the innovative methods that are being developed and used in order to minimize impacts that can be caused by those withdrawals, so I look forward to seeing and learning from the experience of other states so if and when Ohio begins to see some of the larger hydraulic fracturing operations that we will have the wisdom imparted from those other states that are pioneers in wrestling with those issues.

Mr. COSTA. Yes. My time has expired, but I would like to pursue that further. Maybe there is something that we can do to bring together the states that have significant natural gas shale potential and hold some sort of workshop that would bring together best management practices and have that discussion as we move forward in this. The gentleman from Colorado is next.

Mr. LAMBORN. Thank you, Mr. Chairman, and, Mr. Kell, thank you for what you and the other state regulators around the country are doing. My first question is this: Former EPA administrator, Carol Browner, reported to Congress in 1997 that the states were adequately regulating hydraulic fracturing and that no overriding Federal rule was necessary because of the lack of risk or exposure. Do we need Federal regulation if there is no risk or exposure as in her words?

Mr. KELL. As a member of the Ground Water Protection Council and a representative of Ohio and as indicated in my testimony, we believe that the states are doing an effective job in the management of this and do not support or believe there is a necessity for a Federal oversight program for drilling and completing and treatment of oil and gas wells.

Mr. LAMBORN. Since her statement in 1997, 12 years ago, has anything changed since then that would change that position?

Mr. KELL. No.

Mr. LAMBORN. Second, can you amplify on the letters that five of the six states that you mentioned earlier submitted for the record, and why were those six states chosen to submit letters for the record?

Mr. KELL. The six states were chosen because they were specifically referenced in the article that attributed thousands of cases of groundwater contamination specifically to the practice of hydraulic fracturing. The state directors from all six states were contacted. The State of Colorado has a new director and was unable to respond in the short timeframe provided, so I can't speak on behalf of the State of Colorado, but the other states that were referenced, the directors have a long-standing history.

When citizen complaints arrive with regards to alleged contamination of groundwater by industry practices, we evaluate all those. We investigate those, and we look for causation, and most states have had long-standing investigative programs, and we identify sources of contamination when in fact the oil and gas industry has caused impact. Those five directors, who are very familiar with their specific programs have all stated that in the history of their investigative programs they have not diagnosed a single water quality problem as resulting from hydraulic fracturing.

It is not to say there weren't problems related to oil and gas operations, but the hydraulic fracturing practice was not identified as one of those causation factors.

Mr. LAMBORN. Now, the factors that they cited that contributed to contamination, like operator error or improper techniques for upper well casings, et cetera, et cetera, are those being addressed by current regulations?

Mr. KELL. State regulations either currently address those or in response to trends and problems that are recognized. As Mr. Helms testified, the states are very competent and committed, and when we recognize there are issues that are identified as causing issues, we work diligently toward upgrading our permit conditions, our regulations and statutes.

Many of the problems referenced by those articles were, in fact, legacy issues that many states have already addressed through the legislative process, including old earthen storage pits, line leaks and other things that have since been corrected through the regulatory process.

Mr. LAMBORN. OK. Thank you. Lastly, a question for Mr. Duncan of the U.S. Geological Survey. In the event natural gas production were to be reduced because of regulatory restraints imposed on the use of hydraulic fracturing, would there be alternative environmental risks arising from the other sources of energy to which this country would have to turn?

Mr. DUNCAN. That is a tough question to answer. Generally, the U.S. Geological Survey does not try to predict what future energy resources might be used. We try to make sure that our research and assessments are relevant to the priorities of the Nation, and if additional geologically based energy resources were to become important in our economy, we would certainly look at those with our research agenda.

Mr. LAMBORN. OK. Thank you, and, Mr. Chairman, I would yield back my last nine seconds.



[Laughter.]

Mr. COSTA. Your last five seconds. Thank you. I have been informed that we are going to have votes at about 11:15, so obviously with all the Members of the Subcommittee here, we are going to try to get through that, but we will have to come back if we want to make sure that everybody gets a chance to get their questions in and to go a second time. Mr. Hinchey was next followed by Mr. Boren, but, Mr. Boren, did you work that out?

Mr. BOREN. I have to run out something if the Chairman would indulge me quickly?

Mr. COSTA. Well, if Mr. Hinchey wants to defer.

Mr. HINCHEY. How quickly are you going to be?

Mr. BOREN. Go ahead. Go ahead.

Mr. COSTA. Mr. Hinchey, please proceed.

Mr. HINCHEY. Thank you very much, Mr. Chairman.

Mr. COSTA. Into your mic there, please. There we go.

Mr. HINCHEY. I very much appreciate the opportunity to focus on this issue. This is a very important issue.

Mr. COSTA. Right.

Mr. HINCHEY. It is not an issue that is newly important. It has been around for a long time. It is something that this Congress focused on back in 1974 in a number of other states. We have some very strong regulations in the State of New York. I just want to express my appreciation to all of the gentlemen who are here and the statements that they have given and the responses that they have given to the questions, especially to Mr. Appleton, and I want to congratulate him on all the hard work that he has done and the effective work that he has done.

I am very happy to see him here today and have an opportunity to listen to the things that he has to say. I don't think anyone here, and I don't know of anyone frankly who is opposed to the use of natural resources in our country. We know that we are heavily dependent upon foreign oil and that we are necessarily going to use the resources that we have here, the energy resources that we have in our own country, so no one is opposed to the drilling of natural gas.

But, clearly, we are interested in making sure that activity is done in a way that is not going to be injurious to other people, and that is the main point here. That Safe Drinking Water Act, which was passed back in 1974, was largely focused on that issue, and it was focused on that issue based upon experience. The experience was that some drilling that had been used by some corporations in places around the country had contaminated water supplies and had other adverse effects on the environment, so the Safe Drinking Water Act was put into effect in 1974.

Something very strange happened in 2005 here. As a result of initiatives put forth by the Bush Administration, the Congress cooperated with them, and they repealed the drilling for natural gas from the Safe Drinking Water Act so that the drilling of natural gas could go forward without having that kind of regulation and oversight engaged in it. That was, in my opinion, a big mistake. Some of us voted against that for that reason and other reasons, but nevertheless it is in play now.

As a result of that, we have seen a number of issues where states have been adversely effected: Arkansas, Alabama, Colorado, Texas and other states have been effected by the way in which this drilling occurs. One of the ways in which the drilling occurs is the use of chemicals in the drilling process, and with the use of those chemicals, there is a large problem: The contamination of water. That contamination of water could effect people's private wells, or it could effect larger water supplies, reservoirs, things of that nature.

We are very interested in how this thing is going forward. I wanted to ask a question of Mr. Kell, if I may. I know that you have done a lot of work, and I know also that you require financing from outside sources. Can you tell us some of the finances that you get from outside sources to do your research and the effect that might have on the outcome of that research?

Mr. KELL. Mr. Hinchey, I believe your question pertains to the work of the Ground Water Protection Council?

Mr. HINCHEY. Correct.

Mr. KELL. The Ground Water Protection Council conducts research through a variety of financial sources, including Federal grants from U.S. EPA, from United States Department of Energy, from dues and corporate supporters.

Mr. HINCHEY. And the oil and gas industry makes a contribution?

Mr. KELL. There are members of a variety of industries that contribute.

Mr. HINCHEY. Yes, but I know. I am just asking you about the oil and gas industry. You receive funding from the oil and gas industry to do this research, is that correct?

Mr. KELL. In some cases, that is correct.

Mr. HINCHEY. OK. Well, I just wanted to make sure that this may not be done in a completely objective way, that there may be some outside influence. That is something that we all have to keep in mind.

Mr. KELL. I would emphasize that our opinions are not for sale and that our emphasis is on the protection of groundwater resources.

Mr. HINCHEY. Thank you. I wanted to ask Mr. John about some of the ways in which companies that he deals with engage in the fracturing. We have information that indicates that the fracturing fluids contain some toxic chemicals, such as benzene, and benzene is, as we know, not biodegradable. As Mr. Appleton was telling us a little earlier, these kinds of materials stay out there indefinitely, and they can have long periods of adverse effect on the environment, particularly on one of the issues that is most important to human life, and that is good quality water.

What are the chemicals that are used for the fracturing for this natural gas drilling?

Mr. COSTA. Mr. John, could you be succinct in your answer. We have gone beyond the time, and I want to make sure everybody gets a chance to ask their questions.

Mr. JOHN. Very good. I will try to be as brief as I can. I would first draw attention to some of the materials that have been provided to the Committee. Certainly, there is what we call a fact

sheet that is provided by Chesapeake Energy that is in the package of information that I have provided that lists all the chemicals that are used in the fracking process, and I know in the DOE primer, there is another list of those chemicals that are provided there.

I would emphasize that in my experience, we have not seen any problems associated with hydraulic fracturing in my career to the extent that your concerns aimed would acknowledge that hydraulic fracturing has been around since the 1940s or 1950s. It is a process that has been employed by our industry for that long of time on just thousands and thousands of wells, but as far as the list of chemicals, rather than my trying to recite them, I would draw your attention to the material that has been provided to you.

Mr. COSTA. Thank you. The next Member is the gentlewoman from Wyoming, Ms. Lummis.

Ms. LUMMIS. Mr. Chairman, in deference to Mr. Boren's need to be elsewhere, I would defer my time to him for now if I may reserve it later.

Mr. COSTA. Well, the gentlewoman may reserve it later, and that is very kind of her, and that means that the gentleman from Oklahoma will get an opportunity to ask his questions.

Mr. BOREN. Thank you so much. There are 109 FFA students from Oklahoma who will thank you for this who are waiting on the Capitol steps for a photo with our Oklahoma delegation.

[Laughter.]

Mr. COSTA. I suspect there will be some other thank you's that you will need to make to the State of Wyoming, but please go ahead.

Mr. BOREN. Yes, absolutely. Everyone has thrown in their North Dakota story. My wife's grandmother lives in Ashley. They had the only restaurant in Ashley, North Dakota, so we have to throw that in there.

[Laughter.]

Mr. BOREN. That actually calms me down a little bit because of all the rhetoric that is kind of being thrown around today about these issues. One from Mr. Appleton about golly, the oil and gas industry is making so much money. They can afford basically to have this over-regulation is what I term it. Right now in my district in the State of Oklahoma in the Second District in places like McAlester and Atoka and Coalgate, one of the poorest districts in the country, natural gas companies are stacking their rigs.

There are companies like Frac Tech that are laying people off because the price of natural gas is anywhere from \$3.00 to \$4.00 or maybe a little bit above, and these shale wells that we are talking about, those economics don't work at \$4.00, so these folks are laying people off. People are hurting in my district, and these are not Republicans or Democrats. These are Americans. A lot of them are blue-collar Democrats by the way. It is not one party or the other, and some Republicans as well.

I think really what Mr. Appleton is doing is searching for a problem that does not exist because looking at all these other examples and all these states where there has not been a problem. We just heard from the testimony from Mr. Kell, from others that looking into these allegations of these thousands of allegations, there has not been a problem with hydraulic fracturing. Then, there was a

reference that Mr. Hinchey made to EPAct 2005. The President of the United States, Barack Obama, voted for that bill.

I stand with the President on this in supporting hydraulic fracturing, so I wanted to bring that up, and I think a lot of Members on the Democratic side of this aisle voted for that same piece of legislation, including the President of the United States. I also want to say by throwing anyone's credibility to the side of saying well, you are supported by the oil and gas industry. Well, what if you are supported by the Sierra Club, by campaign contributions?

We could say that about any one of us, and I am proud that I am supported by the oil and gas industry because they employ a lot of people in my state, and I am going to stick up for them, and I am tired of people trying to shut down an industry when they are not educated on the facts. I am sick and tired frankly of a lot of folks in my own caucus coming after the largest employer in my state, and I am going to keep fighting for them, and I want to go to Chesapeake, who employs a lot of people in my state.

How deep, Mr. John, are these shale wells on average? Can you talk about that, and how much distance is between the actual fracturing and fresh water?

Mr. JOHN. Yes, sir. I work in the eastern part of the United States. I am out of Charleston, West Virginia, so my familiarity is more with the Marcellus Shale than the other major shale plays that Chesapeake is involved with, but I can give you some information. The Marcellus wells that we are currently drilling in northern West Virginia and northern Pennsylvania are about 8,000 feet deep. That is 8,000 feet down, and then we will drill a horizontal lateral that may be as long as a mile at that depth.

We would expect fresh water aquifers in those areas to be 200 or 300 feet deep, so that is essentially the distance between the shale gas that we are extracting and the aquifers if that is getting to your questions. In plays like the Haynesville, the Haynesville Shale is deeper than the Marcellus Shale. It is deeper than 10,000 feet. The Fayetteville and the Barnett are somewhere in between.

Mr. BOREN. And if you weren't able to do this hydraulic fracturing, how much of the natural gas industry would go away, and how much more would we be dependent on foreign oil and terrorism?

Mr. JOHN. Yes, sir. I believe as far as the shale plays are concerned, the four shale plays that we have been talking about, hydraulic fracturing is absolutely essential to the development of those plays. We would not be able to produce natural gas without being able to frack those wells.

Mr. BOREN. And last question. We talked about green jobs and solar and wind. What backs that up when the wind stops blowing, and there is no sun? What backs that up mainly? Is that natural gas would you say?

Mr. JOHN. I would expect it to be natural gas, yes, sir.

Mr. BOREN. OK. Thank you very much.

Mr. COSTA. That is what Boone Pickens says I think.

[Laughter.]

Mr. COSTA. Anyway, our next Member is again the gentlewoman from Wyoming, who was very gracious in deferring her time.

Ms. LUMMIS. Thank you, Mr. Chairman, and I would like to thank those of us who joined us today. I am from the State of Wyoming where I served briefly on our Oil and Gas Conservation Commission, so I am aware of the kind of regulatory mechanisms that are in place in our states to address the issues we are discussing today. Mr. John, you discussed in your testimony the huge energy potential that shale basins across the country pose to meet America's energy needs. A couple of our people today testified that it is a game changer.

Can you speak to what effects Federal jurisdiction over the process of hydraulic fracturing would have on our energy industry's ability to extract these resources?

Mr. JOHN. Yes. I would begin by reiterating what was mentioned earlier, that it is clear that hydraulic fracturing is required in order to cause these plays to be viable in order to extract the gas. We would also emphasize that we are confident that the existing regulatory framework is adequate for the protection that needs to be in place to allow that fracturing to occur.

I believe that depending upon the level of additional regulatory burdens that it could have a very significant impact on our ability to develop the shale and to develop the natural gas that we believe so confidently we have discovered there.

Ms. LUMMIS. Mr. Chairman, would any of the other regulators on the panel be interested in commenting on that as well? Yes, sir?

Mr. HELMS. Representative Lummis, Lynn Helms from the great State of North Dakota. I think perhaps the best example of the impact would be to look back to the 1990s when the LEAF lawsuit brought about Federal regulations on hydraulic—

Mr. COSTA. Which lawsuit did you say? I am sorry. I didn't hear you.

Mr. HELMS. I beg your pardon?

Mr. COSTA. Which lawsuit?

Mr. HELMS. LEAF, L-E-A-F. I can't remember what the L-E-A-F stands for now. It was in the State of Alabama, and it dealt with coalbed methane hydraulic fracturing. It brought about the requirement for the State of Alabama to promulgate new regulations with regards to coalbed methane hydraulic fracturing and resulted in pretty much a two-year moratorium on any kind of drilling or activity in that industry within the State of Alabama.

That is pretty typical of what you would be looking at if you implemented Federal regulations. It would be about two years before those things could be on the ground and implemented, and the industry could restart.

Mr. KELL. I might comment as well. Aside from impacts to the industry, the Board of Directors of the Ground Water Protection Council has opposed the reclassification of hydraulic fracturing as a permitted activity in the UIC Program on two bases: That is there is no evidence that it is necessary. Second, it represents a diversion of limited state resources from other higher priority activities that they are wrestling with toward an issue that has not been identified to date as high risk.

Ms. LUMMIS. Mr. Kell, that is a great point. I am a rancher, and I ranch next to an oil refinery, and we waited 19 years between the time when the refinery next door signed an administrative order on

consent under RCRA to clean up our land before they ever lifted a shovel. If our regulatory agencies cannot move more quickly than that to protect our environment now under RCRA, they certainly don't have time to regulate the myriad of activities that occur around the country with regard to hydraulic fracking.

In other words, I am not opposed to Federal regulation of activities that the Federal government is best at regulating, but I am opposed to the Federal government regulating activities that it is not best at regulating. Mr. Chairman, I have with me today from the State of Wyoming its position on this issue. I have a joint resolution passed during the 2009 general session of the Wyoming State Legislature asking Congress not to extend Safe Drinking Water Act jurisdiction over the hydraulic fracturing process. I ask unanimous consent to submit this document to the Committee record.

Mr. COSTA. Without objection, the will of the State Legislature of Wyoming is now heard.

Ms. LUMMIS. Thank you, Mr. Chairman, and a followup question.

Mr. COSTA. Is this a quick question?

Ms. LUMMIS. Thank you. I am just delighted to have had the opportunity—

Mr. COSTA. No, no. The time is expired. You have been most gracious. If you have a quick question?

Ms. LUMMIS. Thank you, Mr. Chairman. To what extent have other state governments or regulatory agencies weighed in in this regard, Mr. Kell and Mr. Helms?

Mr. KELL. As President of the Board of Directors of the Ground Water Protection Council, our Board of Directors consists of directors representing approximately 20 states, and the Ground Water Protection Council has passed resolutions with regards to this issue.

Mr. COSTA. So 20 states have a regulatory framework?

Mr. KELL. I would say that the issue through Ground Water Protection Council has been examined by those 20 states. With the Interstate Oil and Gas Compact Commission, it would have been examined by all the member states.

Mr. COSTA. But that doesn't mean they all have a regulatory framework.

Mr. KELL. Any state that permits oil and gas has a regulatory framework. Included in the Ground Water Protection's Board of Directors are water program administrators as well.

Mr. COSTA. Quickly.

Mr. HELMS. Representative Lummis, in answer to your question, the Interstate Oil and Gas Compact Commission represents 30 member states and passed a resolution very similar to that which you have submitted into the record representing all 30 of those states. In addition to that, the five individual states, North Dakota, Montana, Wyoming, Alabama and Texas have passed similar resolutions and have forwarded those to their Congressmen and Senators here in Washington, D.C.

Mr. COSTA. All right.

Ms. LUMMIS. Thank you, and thank you, Mr. Chairman.

Mr. COSTA. Our next Member from the great region of American Samoa, Mr. Faleomavaega.

Mr. FALEOMAVAEGA. Thank you, Mr. Chairman. I do want to thank you and our Ranking Member and your leadership for calling this hearing. It is very, very important I think to our nation's constant search for an answer to these issues that are not actually new issues. I do appreciate the testimonies that have been given. I would like to ask Mr. Duncan of the USGS—you mentioned that currently our country consumes about 21 percent of the world's energy resources. I was under the impression it is between 25 and 30 percent.

Can I get your source as to where you come up with this figure of 21 percent?

Mr. DUNCAN. That figure comes from the Energy Information Administration.

Mr. FALEOMAVAEGA. Are they the most reliable for this kind of information?

Mr. DUNCAN. While the USGS provides information about resources to the EIA, I can't really speak to how they perform their evaluations of energy consumption in the world.

Mr. FALEOMAVAEGA. All right. I think, Mr. Chairman, the issue is always finding the balance between our nation's needs for energy resources, and then the question that follows it—how do we go about getting it possibly considered environmentally safe and also to consider the public safety. I would like to ask Mr. John in mentioning that this natural gas shale, is it pretty much in the same way that we also go about in processing shale oil, or is this entirely different? I am pleading ignorance here.

Mr. JOHN. Sir, it is different. The process for extracting natural gas from these shales involves the drilling of a well to depths ranging from 4,000 to 11,000 feet vertically, and then going horizontally maybe as much as a mile and then stimulating that rock as we have talked about to allow the gas to flow through the well bore to the surface as opposed to the more mining-like activities associated with shales oils.

Mr. FALEOMAVAEGA. There seems to be a debate here whether or not hydraulic fracturing is an environmentally feasible way of going about obtaining this resource, and I get a sense from Mr. Appleton that he takes a different view on this. Is there a balance that we can strike here? It seems that it is one way or the other. I mean, hydraulic fracturing is a 100 percent safe process of obtaining this resource?

Mr. JOHN. Well, I think it is very important that we certainly consider the facts and consider the record that the industry has put forth over the decades of stimulating wells by hydraulic fracturing. The fracturing technique has been around since around 1950, and as information was provided by Mr. Kell earlier, I am not aware of any documented cases where hydraulic fracturing has fouled groundwater.

Mr. FALEOMAVAEGA. OK. My time is running out. A couple of years ago a distinguished Member of our Committee, Mr. Peterson, from Pennsylvania, mentioned the fact that Canada is currently extracting natural gas offshore, and then they turn around and sell it to us.

[Laughter.]

Mr. FALEOMAVAEGA. And here we are arguing whether or not it is feasible that we should go out and get natural gas in the same way that Canada is doing it right now, and I am just curious are we missing something here? Is Canada implementing a lower standard of environmentally safe procedures in obtaining natural gas than what we are doing? I am just curious.

Mr. JOHN. I don't feel qualified to comment on Canada's standards, but I would certainly emphasize that the shale plays we are talking about are onshore within the United States and that they contain ample reserves and enough gas to certainly supply natural gas vehicles and even to provide natural gas for power generation.

Mr. FALEOMAVAEGA. OK. Mr. Appleton, would you care to comment on that?

Mr. APPLETON. I want to correct any impression that this is an either/or choice. That is as it is laid out in my testimony, there are ways and issues that if we did it, it would make hydraulic fracking, particularly if we would develop a biodegradable, non-toxic fracking fluid, which quite frankly I do not understand why the industry is not trying to do more to get to that point, be there.

All of the improvements of regulation you heard are very welcome because basically what we are talking about in this first tier before we get to overall energy policy is good housekeeping. Good housekeeping is something virtually every other industry in the United States is expected to keep. I don't do a lot of the community work, and I would encourage this Committee if it wants to get more on the impacts on the supposed 100 percent performance level that they should have in front of them some of the community groups that have been dealing with these kinds of local impacts.

Nor did I say that every time you frack a well that you create an environmental problem. Basically, all you have to do in these fracking wells is have two percent of them go south, as I said in my testimony, and you have a very widespread number of environmental incidents.

The question is, as I tried to pose it, is this industry prepared to approach these problems sustainably, or does this industry continue to insist upon the right to pose these risks to water and to externalize other costs upon the rural landscape? Because if that is the situation, then it becomes essentially a form of corporate subsidy.

Mr. FALEOMAVAEGA. Thank you. Mr. Chairman.

Mr. COSTA. Thank you. Supposedly votes are going to be coming soon, meaning in the next 10 minutes or so. I think we will get a chance to at least have two Members ask their questions. For those of you who are wondering the order that you are in because it is the Chair's intention to come back after the votes, there are three votes, so it will take about 25 minutes, so we will have a break.

It is Mr. Gohmert and then Mr. Heinrich and then Mr. Fleming and then Ms. Degette and Mr. Sarbanes and then Mr. Holt in the order that you have come. That is the Chair's intention, so with that understood, we will continue to move along until votes are called, and we will try to go about five and 10 minutes left for the vote. Mindful of the Majority Leader's admonition two weeks ago, I don't want to put Members at risk here of missing a vote, so we



will get out of here when there is at least more than five minutes to vote.

Mr. Gohmert, with that understanding, you are next. Tee it up. The gentleman from Texas.

Mr. GOHMERT. All right. Thank you, Mr. Chairman, and I do appreciate the witnesses being here, your insights, your opinions, and I do agree. I mean, we all should agree. Drinking water is critical. You can't have life without drinking water.

Then, as I look, and we have a graph here that is done on a map of the United States from the Department of Energy that shows the different depths the drilling goes to in order to hit different shale formations, and it concerns me when you look at the different formations in the different states that once again we are being asked to provide a one-size-fits all from Washington when some states are doing a better job than other states.

Just as some states do a better job on educating than other states, it is not an enumerated power, and yet the man I have immense respect for, George W. Bush, nonetheless violated the Tenth Amendment and decided to have a one-size-fits all on education and did significant damage to schools and especially special needs kids in my district.

Now I am concerned we have people who want to have a one-size-fits-all from Washington on shale, which is doing immense good in a difficult economy, providing jobs, providing money that is providing taxes and paying for schools and paying local economy, and independent operators have told me that if the Federal government takes over hydraulic fracking, I won't be drilling anymore. These kids that are coming out of high school and trained as welders are getting great jobs and paying taxes and having families. That will stop.

We don't need another one-size-fits-all to do damage. Some states are allowed to do better than others. The Tenth Amendment says if it is not an enumerated power, it is reserved to the states and the people, and we ought to allow some to do better. That is what is great about this country, and if one state wants to tax their wealthiest so high that they run to other states, let them do it. That is their right. We welcome them back in Texas if they want to come down there.

If a state wants to say, "You know what? We don't want drilling in the Great Lakes, off our coast, we will let Canada drill the Great Lakes, and being the good neighbors that they are, we know they will sell us natural gas that we could produce ourselves because they are good neighbors." That is their right as well. Now, there are some states that are being adversely affected, and they need to step up and take care of their state, and I appreciate the reference and the concern, Mr. Appleton, about global warming and not getting proper consideration, but you may not have gotten the memo.

You are supposed to say climate change because there is emerging evidence that the planet may be cooling, and so that contributions don't slow up to the groups that have been fighting global warming you need to say climate change. I have read an article recently that says you know what? We have been advocating that CO<sub>2</sub> may be trapping additional heat in the atmosphere, and that

is what is causing warming, but you know what? It may be that the CO<sub>2</sub> is causing the sun rays to bounce off the planet, so it might be the cause of cooling if that is what is happening.

You are going to have it either way, and eventually we will get around to looking at the sun and noting that when there is more solar activity, more solar flares, it seems to have a direct effect on our temperatures here, but anyway, there is a huge difference noted in the chart. The Haynesville/Bossier shale that is in my district and in Louisiana, there is about 10,000 feet of difference between the producing scene and the ground surface, and they are drilling in downtown Fort Worth, and they haven't had problems so far.

They are drilling. I see the rigs out there at DFW Airport every week when I fly in and fly out. That is a huge difference from the Antrim in Michigan that maybe has 1,000 feet between the producing scene and the ground surface. We don't need a one size fits all, and I have read the testimony, and I appreciate that.

I just wanted to be sure and get a perspective in from somebody that is very familiar with energy production because it is going on in my district, and we are very proud that we had an effect in Dan Boren's training, who did some of his growing up in my district in Longview, so anyway, thank you, Mr. Chairman, and I do yield back.

Mr. COSTA. And thank you, always.

[Laughter.]

Mr. LAMBORN. You don't know what you just thanked him for.

[Laughter.]

Mr. COSTA. Yes. I won't retract the thank you. The next colleague of ours from the State of New Mexico, Mr. Heinrich.

Mr. HEINRICH. Thank you very much, Mr. Chairman. I want to kind of take a little bit of a different tack, and I will try to be a little brief and not add too much CO<sub>2</sub> to the already very dense environment.

[Laughter.]

Mr. HEINRICH. We are trying to get at this I hope from a standpoint of more science and less ideology. I know that is difficult for us sometimes. My question really has to do with what do we do with these fluids once they are back on the surface?

You mentioned, Mr. Kell, the letter from New Mexico regarding the fact that we really don't have a big issue with this in terms of contaminating usable water underground, but we still are grappling with contamination, basically, of surface water—some of it historical and some more recent based on this whole idea of good housekeeping and the best way to do that.

My concern is what do we do with these fluids when they are back on the surface? What level of uniformity and consistency is there of making sure that we are doing a good job disposing of these fluids and other waste products that are inherent to the oil and gas business once they are on the surface, and how do we continue to improve that process? In addition, I would mention that while we had zero cases of usable groundwater contamination, we have a number of cases of surface water contamination from products at the surface.

I think that is really one of the areas where I would like to see us continue to improve.

Mr. KELL. You raise good points. I think if you were to speak to most state directors, they would recognize two critical elements of protecting groundwater resources as well as surface water in the process of exploration and development, including hydraulic fracturing of oil and gas wells, and those include the construction standards by which wells are drilled and constructed and, second, the management of return fluids and byproducts associated with both the hydraulic fracturing and the ongoing production practices.

I can tell you within the State of Ohio that all fluids that are returned to surface from the practice of hydraulic fracturing are either returned into lined pits or into steel tanks, and they are promptly removed by registered brine haulers taking to Class II injection wells permitted pursuant to a U.S. EPA approved program in accordance with underground injection control regulations promulgated pursuant to the Safe Drinking Water Act, and all of them are injected deep below the surface.

I can also tell you that in 25 plus years of managing that program, we have not had a single groundwater contamination incident resulting from that deep injection. Other states that may not have as highly saline produced waters are also exploring options of recycling, treatment and engage in other waste management practices. I can't speak in detail for the State of New Mexico, but I can refer you to their excellent director, Mark Fesmire, as one who continues to work toward improving environmental protections in New Mexico.

Mr. HEINRICH. Thank you, Mr. Chair.

Mr. COSTA. Thank you. Our next witness is Mr. Fleming I believe from the wonderful State of Louisiana.

Mr. FLEMING. Thank you, Mr. Chairman. I would like first of all to ask unanimous consent to enter in the record the 2008 economic impact of the Haynesville Shale into the record, please?

Mr. COSTA. The what?

Mr. FLEMING. The economic impact of the Haynesville Shale on the Louisiana economy of 2008.

Mr. COSTA. All right. Without objection.

Mr. FLEMING. I would just like to outline, gentlemen, first of all before I get to my question what the Haynesville Shale has done to my district in north Louisiana. While the rest of the country is going through a severe recession, we are doing quite well, and it is thanks to the Haynesville Shale and other developments, too.

Certainly, Chesapeake is a major player in this, and just to give you an idea, it is estimated there is 234 trillion cubic feet of natural gas production potential, and I even hesitate to say that because every time word comes out of what the potential is, it becomes obsolete, and it becomes much larger. We don't know where that is going to end. Impact on jobs—it has created nearly \$3.9 billion in household earnings in 2008. It is creating indirect industry jobs.

It has been quite frankly a boon, and I am unaware of any accidents, any problems, any groundwater difficulties in this whatsoever. It is kind of interesting in the discussions that we have had here. One of the things I have concluded is that when we talk

about ordinary use of fossil fuels and even nuclear energy that our technology is really ahead of our implementation.

Take, for instance, nuclear power. We haven't built a new nuclear plant in decades, don't know when another will be actually built, and yet our abilities with nuclear power, which has zero CO<sub>2</sub> emissions is far beyond what it was 20 years ago or even 10 years ago. On the other hand, we talk about green energy, which makes up approximately 1.6 of energy production in the United States, such things as wind, which is not reliable, and solar. We are trying to implement these technologies when they really have not been advancing very quickly at all.

A gentleman from Spain, who testified to another group of us, said that they would not exist in their country if it weren't for the subsidies, so that brings me to another point, and I want to ask, Mr. Appleton, did I understand you correctly that you said that lack of regulations, or I shouldn't say lack of regulations, but reduced regulations or non-Federal regulations is a subsidy to the natural gas industry?

I am kind of sensing from your statement that what you are suggesting is that we need to artificially raise the cost of fossil fuel energy production in order to make so-called green energy production more cost effective. Obviously, that is two men out on a boat, and both of them shooting a hole in the bottom. My constituents want to see energy costs go down. They don't want to see them go up and certainly not artificially to make green energy comparatively more affordable, so if you would please expound upon that, sir?

Mr. APPLETON. Well, there are a couple of key words in that characterization: One is artificially, whether or not you are externalizing a cost, and a producer is forced to internalize that cost whether that is an artificial increase of price or more accurate price. I mean, basically I am a free-market Libertarian, and I believe in Adam Smith, and I believe in the invisible hand and the things that undermine the invisible hand are government subsidy, tax preference, perverse incentives, collusion, corruption and externalized costs.

The question would really be whether you and I would agree that partaking out of that particular practices are externalized costs. The other thing though, and I obviously believe that externalized costs are. Part of what I did and part of what I continue to do is I am very sympathetic to the representatives from Texas, this concern about one-size-fits-all regulation. I spent most of my career helping people do environmental things faster, quicker and cheaper and avoid some of the rigidities of regulation.

There is a basic level of environmental housekeeping that has to be taking place here. For example, going back to the question on surface water drinking, I am very reluctant to allow any discharge of even toxic treatment-level waste into surface stream waters. On the other hand, underground injection, if done properly, can in fact be a very effective way of disposing of this stuff. I would like to draw to the Committee's point this anomaly.

It was just described how in Ohio this material is deposited for deep injection in very carefully and closely regulated wells, but at the same time, if you are drilling and then leave it in the ground,

the same material if you bring it up you then have to reinject under this regulatory scheme. There is no regulation of leaving that original drilling material in the ground at all. That is a huge inconsistency.

Now, when you take time into effect, that is water migrates over time, the question is going to be if you make wrong mistakes because you don't look at this underground hydrology, who 30, 40, 50 years ago is going to pay the cost of these. In Pennsylvania, there are hundreds of abandoned wells that are still leaking acid into the streams because no one went with this program, so I completely concur with the need to avoid one-size-fits-all regulation, but in terms of the larger cost question, the cheapest price for energy will be the most accurately costed price.

That is a fundamental premise of free-market economics.

Mr. COSTA. Your time has expired.

Mr. APPLETON. I postured a little bit. I am sorry.

Mr. COSTA. It was more than expired, but anyway, I enjoyed the response. We will complete this last question with the gentleman from Colorado, and then at that time it is the Chair's intention to recess, and we will have a break for about 25 minutes, and then we will come back for those Members who have not yet had an opportunity to ask questions, and we will entertain the possibility of a second round. Congresswoman Degette?

Ms. DEGETTE. Thank you very much, Mr. Chairman. I want to thank you for your comity in allowing me to sit in on this Subcommittee hearing. As you know, Mr. Hinchey and I have been working on the issue of hydraulic fracturing for a number of years, and we are getting ready to reintroduce our legislation next week that makes hydraulic fracturing reporting requirements subject to the Safe Drinking Water Act. Right now, it is the only industry that is exempt from that bill, so it would simply bring the reporting requirements into compliance.

I want to be really clear because I know we have a lot of members of the oil and gas industry here. I don't object to hydraulic fracturing. Mr. Hinchey doesn't object to hydraulic fracturing. We just want to make sure that it is done in a safe way that protects the drinking water, and out west, we have had a lot of experiences with different kinds of mining techniques over the last century that have caused human health risks and severe environmental damage, so we just want to make sure it complies with the law.

When I hear all of the objections that I have been hearing and the scare tactics that I have been hearing from the industry, I can't help but be reminded of what Queen Gertrude told the young Hamlet when she said, "Thou dost protest too much." If there is really nothing wrong with the chemicals contained in fracking fluid, why wouldn't we make it subject to the reporting requirements of the Safe Drinking Water Act?

That is the issue I want to explore a little bit, Mr. Chairman, in my questions today. The first question I want to ask Mr. Appleton for maybe a slightly briefer answer than to the last question.

Mr. APPLETON. OK. Fair enough.

Ms. DEGETTE. Which is in your testimony you of all the members of the panel said that the chemicals used in hydraulic fracturing are intrinsically dangerous to the environmental and public health.

When you refer to those chemicals, are you referring to carcinogens and endocrine disrupters, benzene, toluene, diesel fuel and industrial solvents?

Mr. APPLETON. All of those and more.

Ms. DEGETTE. OK. Can you just briefly list more?

Mr. APPLETON. No, I can't, but I can submit for your use a list.

Ms. DEGETTE. OK. If you can supplement your testimony, I would ask unanimous consent, Mr. Chairman, he be allowed to do that. Now, Mr. John, I would like to ask you in your testimony you say that hydraulic fracturing absolutely does not pose a threat to drinking water, so if that is true, why would you object to the disclosure of the chemicals used in the fracking process under the Safe Drinking Water Act?

Mr. JOHN. As I mentioned earlier, the information packets that we provided to the Subcommittee—

Ms. DEGETTE. No. Why would you object? If it is perfectly safe, why would you object to disclosure of the chemicals that are used?

Mr. JOHN. What I was saying was that we have disclosed today and prior to the hearing—

Ms. DEGETTE. Which chemicals are used?

Mr. JOHN. Yes, ma'am.

Ms. DEGETTE. In each process?

Mr. JOHN. They are listed in a frack fact sheet that has been provided by Chesapeake.

Ms. DEGETTE. So in that case you would have no objection to my bill.

Mr. JOHN. We have supplied that information as part of our—

Ms. DEGETTE. So would you have an objection to my bill then since you have already supplied that information?

Mr. JOHN. I am not personally familiar with your bill, ma'am.

Ms. DEGETTE. Well, what my bill does is it makes the chemicals used in hydraulic fracturing subject to the reporting requirements of the Safe Drinking Water Act. It would seem to me since you have already disclosed those chemicals you would have no objection.

Mr. JOHN. As stated earlier, we believe that the current regulatory framework—

Ms. DEGETTE. Yes or no.

Mr. JOHN. We believe the current regulatory framework is adequate.

Ms. DEGETTE. So yes, you would object to my bill because you don't think we would need to report it under the Safe Drinking Water Act even though you say the chemicals are safe, correct?

Mr. JOHN. Correct.

Ms. DEGETTE. OK. How about you, Mr. Kell, Now, are you saying unequivocally that hydraulic fracturing fluids cannot possibly be to blame for water contamination seen in cases across the country because in your testimony you say that the reports of contamination are not accurate.

Mr. KELL. In my testimony, I addressed allegations that were presented through certain media outlets relative to six specific states. We did not survey all states that have oil and gas activity, and therefore would not make the statement that no one has ever identified—

Ms. DEGETTE. OK. Thanks. You know, it is kind of a chicken and an egg thing to me because since they don't have to report what is in the fracking fluid, it is hard to prove that the injuries that we are seeing as a result of being exposed to the fluid are caused by the fluid.

Mr. KELL. And I could comment on that.

Ms. DEGETTE. I wish you would.

Mr. KELL. Within existing state authorities, there are quite a few states that do require and require companies to make available the chemical constituents used in hydraulic fracturing operations. I can tell you that Ohio currently is not—

Ms. DEGETTE. OK. I really apologize. Can you also supplement your answer with that because I only have five minutes, and it is just about over.

Mr. KELL. OK.

Ms. DEGETTE. In fact, it is over. I just want to ask one more question. Would you mind supplementing your testimony because I would like to know.

Mr. KELL. I am sorry, I am not familiar with the process.

Ms. DEGETTE. OK. We will work with you on that. Mr. Duncan, just one last question. You might not know this, but you are my government expert, so I am going to ask you, 34 states now administer the Safe Drinking Water Act for other types of industries, correct?

Mr. DUNCAN. I am not familiar with—

Ms. DEGETTE. We have many situations of Federal laws where the states administer them, wouldn't that be an accurate statement?

Mr. DUNCAN. That is my understanding.

Ms. DEGETTE. Thank you. Thank you very much, Mr. Chairman.

Mr. COSTA. All right. Thank you. The process is this. Members have 10 working days to submit questions to witnesses that they would like to have responses to, so if Members of the Subcommittee or other Members, the Chair will entertain the opportunity to submit those questions, and then you can respond to whatever questions are submitted to you. Does the Ranking Member have something?

Mr. LAMBORN. Yes. Before we leave, I would like to submit for the record with unanimous consent testimony from a consortium of trade associations representing oil and gas producers and their vendors and suppliers.

Mr. COSTA. All right. Without objection, so ordered. All right. We are going to recess at this time. We have three votes. It should take about 25 minutes. It is the Chair's intention to come back, and whoever shows up here, we will give them the opportunity to ask their five minutes-worth of questions. We will play it by ear as to whether or not we do a second round. Thank all five of the witnesses, please, and we look forward to seeing you when we come back.

[Recess.]

Mr. COSTA. The Subcommittee on Energy and Minerals will now reconvene after our recess. We have voted. Next votes are not for a couple of hours. It is the Chair's intention to allow those who have not had an opportunity to have their five minutes to do so,

and then those remaining Members that are here that have already had a chance, the Chair will entertain maybe one more round bearing the patience of everyone. With that understood, we will begin with the gentleman from Maryland, Mr. Sarbanes.

Mr. SARBANES. Thank you very much, Mr. Chairman.

Mr. COSTA. The great State of Maryland.

Mr. SARBANES. Great State of Maryland. Thank you.

Mr. COSTA. Not that North Dakota is not great as well.

Mr. SARBANES. Right. Well, it is like a newborn. You just think your child is the most beautiful one out there, don't you?

Mr. COSTA. There you have it.

Mr. SARBANES. Thank you to the panelists for being here. I am about as far from being an expert on the topic today as one can get and still be allowed to serve on this Committee, but a couple of things have jumped out at me in the testimony both in terms of what you all have been saying and what I was reading in the Committee's memo and some of the testimony.

First of all, is it the case that we sort of know enough? I mean, I gather this process has been used for a long time, but is it possible that we could discover that sort of the interruption that this process represents for sort of natural geological formation could have effects and results that we don't quite yet understand? Do you all feel comfortable that the process has been vetted sufficiently, that we are not going to wake up 10, 15 years down the road and say boy, we really missed that risk factor, for example, and I invite anybody to jump in on that question.

Mr. APPLETON. I don't think we do. I think the landscape of Pennsylvania that I was referring to earlier is a classic proof of the law of—

Mr. COSTA. Mr. Appleton, could you speak closer into that mic. We all want to hear you.

Mr. APPLETON. Yes, sir, Mr. Chairman. I think the landscape I was describing in Pennsylvania earlier with 800 coal mine fires, 1,000 mines leaching acid are a testimony to the law of unintended consequences, and fluids move slowly, but often inevitably through ground formations. Now, to the extent we have improved that, we have improved that precisely because we have had uniform and careful regulation that factors into what we don't know as well as what we do.

Mr. SARBANES. Right. Did you want to respond to that?

Mr. HELMS. Yes, Congressman Sarbanes, Lynn Helms from the great State of North Dakota. In response to that, I do believe as a state regulator that we know enough to construct well bores in a fashion that protect the groundwater resources and to produce those frack fluids back and dispose of them properly. One of the Congressmen earlier asked, "Is this 100 percent safe, or is it very dangerous?" This thing is not 100 percent intrinsically safe.

Any time that you inject chemical-laden, sand-laden fluid into a well bore at 9,000 pounds per square inch and 1,000 gallons a minute, that is a dangerous operation. We have learned though in 60 years how to construct well bores to control that and also how to meter the fluids coming back, how to put them in tanks and meter them again when they are injected underground and to



make sure that they are placed in saline aquifers where they will be safe for eons.

Mr. SARBANES. What are some of the dangers that can occur?

Mr. HELMS. Well, Congressman, one of the dangers that we have observed in North Dakota in the last year was mechanical failures of pipes or human-caused failures, human error. We had what I call three near misses when we initially began hydraulically fracturing the Bakken Formation. Through our well construction requirements requiring casing to be run through all of the drinking water sources and cemented back to the surface, we were able to protect the underground sources of drinking water from the mechanical failures that happened on the pipes inside the pipes. That was the primary failure.

A secondary failure would be some accidental spill of the fluids when they are produced back to the surface, and that is why we require placement of those fluids into a steel tank or a lined pit. Those pits and tanks are diked and clay put underneath of them so that any fluid that accidentally gets spilled on the ground gets contained and cleaned up right away.

Mr. SARBANES. Are you always going to know if there has been an accidental spill, or can it happen in a way that sort of goes under the radar screen?

Mr. HELMS. Well, Mr. Congressman, we legally require all spills to be reported to the State of North Dakota within 24 hours. We also inspect those sites on a weekly basis. Frequently, my field inspectors will find a spill that went unreported, so I believe that we are seeing 100 percent detection of those spills, and cleanup of those spills, but sometimes it takes legal action.

Mr. SARBANES. Let me move to another topic because you said you think you know what you need to know at your state level. One of the things that is a theme in some of this testimony and in the memo that I looked at is that we don't actually know oftentimes what chemicals are being used in the process because I gather there isn't a requirement now to indicate what chemicals are being used, so speak to that, anybody who would like to.

Mr. HELMS. Yes, Congressman Sarbanes. I have actually traveled out to numerous hydraulic fracturing jobs across North Dakota and, on a couple of occasions, I asked the service company that was on location, there were two different service companies, for the material safety datasheets. They presented me with a booklet that showed every single chemical they had on location and the quantity that was on location, so with very little effort, I was able to determine everything they had.

Mr. SARBANES. Could they have declined to give you that information if they had chosen to?

Mr. HELMS. I don't believe that they could. Under OSHA regulations, they are required to have those MSDS sheets there on the location and to present them to any regulatory authority that requests them. Now, that is going to vary from one hydraulic fracture treatment to another.

I think that is part of the problem with requiring gobs of reporting and recordkeeping of information is that each one is slightly different and is going to have different MSDS sheets there and different quantities, and so we are going to create this humongous

record so to speak of all of these frack fluid recipes, which really I find would not be particularly useful. If I had an incident on one frack job, which I did have one in North Dakota that we had to flow to the pit, I want to know what was in that frack fluid and what is in that pit and what I am dealing with on that particular well site.

Mr. SARBANES. I am going to come back to that topic on the next round. Thank you.

Mr. COSTA. Gentlemen, time has expired. Sure. Just to follow up on that, Mr. Helms, and I am somewhat familiar with the regulatory schemes that we have in California, so you are able to monitor as you stated everything that goes in there in terms of the fluids that are part of the fracturing structure and then monitor them when they come out, and then you talk about double layer clay pits to hold those materials.

Are there some that follow or are required into what would be considered toxic enough to require Class I sites for disposal purposes because you talked about them being taken and put in tanks?

Mr. HELMS. Mr. Chairman, there are a few chemicals that appear on the MSDS sheets that individually would be considered a toxic chemical, for example, benzene, but they are in very, very trace amounts in the fracture fluid, so none of the return fluid that is coming back to surface reaches the level of requiring hazardous waste disposal. All of it qualifies to go into what we consider a Class II waste disposal.

Mr. COSTA. Class II? Yes. Now, I am familiar with Class I and Class II disposal sites, so what do you do in North Dakota with the Class II residual materials?

Mr. HELMS. What we do in North Dakota is we require a measurement of every barrel of fluid that flows back out of that well bore and an accounting of that goes into our computer system, and that is balanced against the reported barrels that show up at a Class II injection well site and are then injected in that Class II well, so every barrel has to be accounted for. It has to have left that location and arrived at a Class II facility and been injected in that Class II well.

If those numbers don't match up, then I have an accounting staff and a field staff that begins to research that discrepancy.

Mr. COSTA. It gets back to that idea about trying to put best management practices with the 20 plus states that are involved in this. I really want to pursue that, but I am not in the conversation here.

Mr. HELMS. And, Mr. Chairman, North Dakota would be very interested in participating in that.

Mr. COSTA. I suspect you would.

[Laughter.]

Mr. COSTA. Mr. Appleton, I enjoyed your discourse on Adam Smith, but distinctions between the ability to deal with both water quality and water quantity, I know your experience is New York City, but in terms of watersheds, do you have enough knowledge to talk about how that is differentiated? I mean, these different plays that we are discovering or determining that are very expensive I suspect play differently whether they are in semi-arid regions or whether they are in very wet regions like the northeast.

Mr. APPLETON. Yes, I do have enough experience, and the question would be?

Mr. COSTA. Well, the question is does one size fit all, or do you have to handle, you believe, the impacts on water quality and water quantity differently?

Mr. APPLETON. Well, you obviously would assess those two differently. The really critical issue here is water quality in that the following premise is a one-size-fits-all premise, which because these materials do not biodegrade and bioaccumulate, that there is only a limited absorbative capacity in streams for any of them to take whether it is washed in through an accidental spill or whether it is discharged as a product of an——

Mr. COSTA. So in essence, one size doesn't fit all is what you are saying?

Mr. APPLETON. Right. I mean, obviously you have to adapt your specific application of this premise, but the basic point is to keep this stuff out of surface stream water.

Mr. COSTA. No. I understand. I think we all agree on that goal. Go ahead.

Mr. APPLETON. The quantity issue is much different. The quantity issue with proper planning can be dealt with. The pressure is because they pay for hauling the water, and that gets very expensive——

Mr. COSTA. Hauling water is not cheap. I know a little bit about that.

Mr. APPLETON. Then people want to use local sources. Local sources tend to be smaller and take much greater impact from the level of water withdrawal that a mainstream river would.

Mr. COSTA. All right. My time is running out. I need to go even for the Chairman. Mr. Duncan, you have been very quiet. Do we have a better sense of the amount of shale gas resource on public lands versus private lands? Have you done any inventory?

Mr. DUNCAN. Yes, that is correct. If you look at the Energy Policy and Conservation Act that asked the USGS to do assessments of resources on priority basins, we focused on unconventional sources like shale gas, and that was primarily on Federal land, so we are just now transitioning to look at say the Appalachian Basin, which is private land.

Mr. COSTA. So you don't really have a good number then or approximation, geological survey on the extent of this resource on public lands versus private lands?

Mr. DUNCAN. That is correct.

Mr. COSTA. All right. And are you working on that?

Mr. DUNCAN. Yes. As I was trying to explain, maybe not so well, I think we have a good handle on the public land side of it, and we are in the process of working on the private land aspect, for example, the eastern United States.

Mr. COSTA. OK. Give us just a timeline if you can today. I will ask the question later as to when you might be able to produce those numbers for us.

Mr. DUNCAN. The numbers are probably, and I am going to be very vague in a sense, several years out, but within the year, we should have the geological framework, in other words the petroleum system model published for the Appalachian Basin.

Mr. COSTA. OK. If I could bear with the patience of my colleagues here, if I can ask one more question, I won't come back for a second round. Well, I might. Mr. John, Chesapeake, what are the challenges you face in the development of this unconventional gas play versus conventional gas plays?

Mr. JOHN. Well, I mentioned earlier that I feel like that we have been focused enough as a company, as an industry on the unconventional major shale plays over the last few years that I think we have advanced significantly the technology that is needed to make this play work both on the horizontal drilling side and on the stimulation side. I think as we go forward, it is a question of demand for us at this point.

Mr. COSTA. Well, demand, but also the prices of natural gas plays into this, does it not?

Mr. JOHN. It does, both supply and demand.

Mr. COSTA. I mean, I would like to see us develop more natural gas. I have some parochial reasons as I mentioned on the outset about air quality. Having said that though, every time the natural gas prices drop below, then people want to burn other fuels that are more problematic as it relates to the air quality issues we have to deal with.

Mr. JOHN. I think that is a great point, and I think one of the reasons—

Mr. COSTA. Where is your break-even point on the unconventional?

Mr. JOHN. It varies by play of course, but I think one of the key aspects of these major shale plays that we are talking about is that the price threshold is much lower for these types of plays than what we have seen from conventional plays up until now.

Mr. COSTA. Like slower or like what?

Mr. JOHN. In the Marcellus, for instance, I would expect that a price of \$4.00 or just above that could yield adequate returns for us to be able to—

Mr. COSTA. Have you had to shut in any of your productions as a result of the drop in prices?

Mr. JOHN. In the Marcellus, we have not. As we look forward, I think corporately we would expect prices, and I am not very good at forecasting prices, I don't know who is, but we would expect I guess a \$6.00 to \$8.00 price range going forward, but the main point I would like to emphasize—

Mr. COSTA. So that is enough to keep you pursuing this unconventional—

Mr. JOHN. Yes, sir, particularly on the unconventional side. I think the players in our industry that have access to these unconventional plays are going to be greatly advantaged due to the low refining costs associated with those plays.

Mr. COSTA. And a final question to you, I saw one of the renderings in our material about the footprint and the intensity of getting a well in production. I didn't know if that was a regular well that they were demonstrating where they had all those trailers parked together. I mean, I am a little more familiar because we do have oil and gas production in my district in Kern County and in Fresno County. Actually, it is some of the largest oil and gas

production in California. People don't think we do that there, but we do, and I know what a footprint is like for that.

Comparing that to a natural gas well on a conventional, is the footprint that much larger?

Mr. JOHN. I don't believe it is, sir. I would offer that for the Marcellus wells that we are drilling in the east, the average footprint maybe somewhere around five acres for one of our drill pads, and we would expect to accommodate six, eight, maybe even 10 wells on that—

Mr. COSTA. Wells within that five-acre footprint?

Mr. JOHN. Yes, sir.

Mr. COSTA. All right. I have gone way beyond my time, and my colleagues have been patient. The gentleman from New York, from the great City of Poughkeepsie.

Mr. HINCHEY. Well, close.

Mr. COSTA. Close.

[Laughter.]

Mr. COSTA. Mr. Hinchey.

Mr. HINCHEY. Thanks, Mr. Chairman. Mr. John, I just want to follow up on some of the things that were just being talked about and be a little more specific. I know that your company is engaged in a lot of hydraulic fracturing. I wonder if you can tell us what chemicals are used in the context of that hydraulic fracturing process?

Mr. JOHN. Yes, sir. The information that our office supplied prior to this hearing listed the chemicals that we use when we frack wells. Included in the packet would have been what we call a frack fact sheet that lists the chemicals that are employed in hydraulic fracturing, and also I believe in the DOE primer, there is a separate list of chemicals that are employed in hydraulic fracturing.

Mr. HINCHEY. So can you tell us what those chemicals are that you use?

Mr. JOHN. If you would indulge me to pull it from the sheet to be sure that I read it correctly? I wouldn't want to offer something from memory that was incorrect.

Mr. COSTA. Please speak a little closer into that mic. We want everybody to hear you.

Mr. JOHN. Thank you, sir. Do you want me to go through all of them, sir? I will start with hydrochloric or muriatic acid as a chemical that would help dissolve some of the muds in the well bore. We would use an antibacterial agent, such as glutaraldehyde. We would have a need for a breaker that would take away some of the viscosity from our fluid that we would use an ammonium persulfate. We would need a corrosion inhibitor to allow the casing strings and the pipes that we use to be preserved.

Mr. HINCHEY. That's the corrosion inhibitor?

Mr. JOHN. Yes, sir.

Mr. HINCHEY. What is it?

Mr. JOHN. It is testing my sight here. It is dimethylformamide. Then, the cross-linker that we would use would be a borate salt. We would then use also a friction reducer that would enhance the safety of the operation by lowering the pressure that we would need to pump the fluid. That would essentially be a petroleum distillate. We would use a guar gum as a way to creating viscosity

so the fluid can convey sand. We would use an iron control agent on some applications, a citric acid. Potassium chloride is used as a fluid treatment. We would also use an oxygen scavenger.

Mr. HINCHEY. All right. Let me ask you another aspect of this question. There are a number of reports that have found toxic chemicals in the fracking fluid. Are you aware of these reports? Have you seen them?

Mr. JOHN. I am sure I have not seen all the reports, no, sir.

Mr. HINCHEY. But have you seen any of the reports, or are you at least aware of some of the reports that have found toxic chemicals in the fracking fluid?

Mr. JOHN. I am aware of the reports, yes, sir.

Mr. HINCHEY. OK. So you are aware of them?

Mr. JOHN. Yes, sir.

Mr. HINCHEY. So if there are toxic chemicals being injected underground, what justification would there be for exempting the Safe Drinking Water Act when all other underground injection activities are still under the regulation of the Safe Drinking Water Act?

Mr. JOHN. As we have stated earlier, I believe that the industry is adequately regulated at the state level, and I certainly feel that the information that has been provided from the Ground Water Protection Council, letters from various states acknowledging that there are no accounts on record, as I understood Mr. Kell's testimony earlier, from hydraulic fracturing would be the answer for that.

Mr. HINCHEY. OK. Well, that is the issue that we are concerned about of course, and we don't like the idea that this particular activity is isolated from the Federal Clean Water Act when every other activity is still under the restrictions and observations of the Federal Clean Water Act. To us, it just doesn't make any sense, particularly when we have these reports that show toxic fluids are showing up in these injection activities, and the consequences of those toxic fluids are having adverse circumstances inflicted upon innocent people.

We have a number of reports ourselves on that, so this is just something that we are trying to deal with in the context of the legislation that Diane DeGette talked about a little while ago. We understand that several of the witnesses claim that there is no evidence, some people, a lot of people claim that there is no evidence that fracking has caused water contamination, but we have seen that there is water contamination in a number of places, and I mentioned those places before—Alabama, Arkansas, Colorado, Texas.

I had a call yesterday from a man in Texas that was talking about the impact of these toxic chemicals on his family and how it had contaminated his water supply. That is why we are trying to deal with this issue. I wanted to ask Mr. Appleton if you are aware of any of the independent, empirical research that has been conducted that in any way suggests that fracking does not pose a risk to water supplies? Is there any proof out there?

Mr. APPLETON. Well, any time you put chemicals like are used in fracking into the environment, it is a risk to water supplies if they are not properly regulated. There is also a problem in states

like New York. They don't require incidents to be reported on a systematic basis, so you can't really determine this issue either way.

Mr. HINCHEY. OK.

Mr. COSTA. Well, thank the gentleman from New York.

Mr. HINCHEY. Thank you.

Mr. COSTA. Mr. Sarbanes, for your last round, and I think we will close the hearing after that.

Mr. SARBANES. Thank you, Mr. Chairman. I am going to pick up on the same theme, and let me give you the perspective I am coming from. Recently, in my state and in my district we discovered leaching from the deposits of fly ash, the coal combustion waste from scrubbing these plants was getting into the drinking water. We had a discussion in this Committee about how science advances, and you discover the things and processes that you thought might not be a problem at one time now do represent a problem, and you can see kind of the cause and effect at work.

Based on that, I continue to be interested in this issue of the use of the chemicals. Mr. Helms, I think you said it was your understanding that there is sufficient regulation to require that the companies disclose which chemicals they are using in the process. I mean, Chesapeake has done this I gather on its own initiative, but my information just from reading the memo is that companies are not required currently, and the EPA is actually looking at this question, to disclose what chemicals they use.

We have had reports that ranchers out west, who are quite strong advocates of this process of the hydraulic fracturing generally and what it produces, nonetheless are concerned that they can't seem to get information from the companies that are doing it as to which chemicals are being used so that they can be on the lookout for possible compromise of the drinking water supply and so forth.

I guess my question to you is if it is the case that a company currently is able to avoid disclosing the chemicals that are used in the process whether as a result of that not being required under state law or Federal law, would you view that as a breakdown in the regulatory framework that ought to exist with respect to this process?

Mr. HELMS. I will take a shot at that. Well, Congressman, I think our discussion is a little bit of speaking toward each other but not exactly at the same issue. The difference in disclosure I think deals with are they required to make a public disclosure to any person who requests that information, or are they required to disclose, for example, to the EPA or to the local health department everything that they did over a period of time, and the answer to that is no.

Are they required under workplace safety regulations and OSHA and various regulations like that, to inform everybody who is working on that location what they have on the location and how much? Yes, so there are different types and amounts of disclosure that are required. I am completely comfortable with the current amount of disclosure, which is making sure that everybody who is there on that location and exposed to those chemical constituents and is going to be working around them be fully informed of what is there and how much is there.

I do not see a great benefit to the public in massive volumes of records of what was hauled to a location and utilized in trace amounts during a hydraulic fracturing job and then later hauled away and disposed of in an underground injection-controlled well.

Mr. SARBANES. Do you see a benefit to the public of small volumes of information as opposed to massive volumes of information?

[Laughter.]

Mr. HELMS. Yes, Congressman. I could see some advantage in specific individuals being able to utilize, for example, a state oil and gas agency to find out what was utilized on their location. I could see that as opposed to—

Mr. SARBANES. Mr. Appleton, I think you wanted to comment.

Mr. HELMS. Just one last comment about the reason for the exemption here. The intention is to remove these fluids from the underground formation and properly dispose of them. They are never intended to be in place and left there like they are in a hazardous waste site or an underground injection, a Class II well.

Mr. APPLETON. I think it is really important this Committee focus on the distinction Lynn made between disclosure to government agencies and disclosure to the public, and much of the complaint about this fracking material is in fact the failure of the public to have access even if government agencies do so.

If I may respectfully disagree with Lynn, I don't think we are talking about pushing volumes of records around to meet what you might call the community-right-to-know need.

Mr. SARBANES. Thank you.

Mr. COSTA. Thank you. I want to make two points as I close the hearing here, and one, the Chair is seriously considering putting together those states that have fracturing taking place where it expands to look at developing a matrix to see what are these best management practices and whether or not there is, as I referenced earlier, a gold standard, what areas there may be deficiencies.

To that end, I would hope that the various interest groups, whether they be industry folks or environmental organizations, would participate and vet that and have some sort of an effort in which we can see how it might complement whatever legislative initiatives are being taken, but I would like to see if we might develop that collaborative framework and have that discussion separate from an actual formal hearing. I would urge all those if we can put that together to participate.

Finally, I want to thank those who have testified here. I think you have done a good job. I want to thank the Members who have participated. We had a good participation in today's hearing. I think it is part of, as I said, a series of hearings that we will be holding with regards to unconventional fuels as we try to cobble together some consensus on what needs to be, in my view, a comprehensive energy policy for this country.

Again, I thank the Members, those who have testified, and now for Mr. Kell, unfamiliar with the process of the procedure. Members of the Subcommittee may have additional questions for you and your colleagues, your witnesses. They are to respond to you through the Committee in writing. Under Committee Rule 4[h], any materials submitted for inclusion in a hearing record must be submitted no later than 10 business days following the hearing.



We will see if there is any followup interest as it relates to Members who want to pursue further questioning to the five witnesses who testified here today. If there is no further business before the Subcommittee, the Chairman again wants to thank everyone, and this Subcommittee is now adjourned.

[Whereupon, at 1:05 p.m., the Subcommittee was adjourned.]

[NOTE: The documents listed below have been retained in the Committee's official files.]

- Fleming, Hon. John, a Representative in Congress from the State of Louisiana, "The Economic Impact of the Haynesville Shale on the Louisiana Economy," by Loren C. Scott and Associates for the Louisiana Department of Natural Resources, April 2009
- John, Mike, Vice President of Corporate Development and Government Relations, Eastern Division, Chesapeake Energy Corporation, Attachments submitted for the record
  - Chesapeake Energy Hydraulic Fracturing Fact Sheet
  - Chesapeake Energy Handout on "America's Abundant Natural Gas Shale: A Timely Response to the Need for Clean Energy"
- Kell, Scott, President, Ground Water Protection Council, Attachments submitted for the record
  - Executive Summary of "Modern Shale Gas Development in the United States: A Primer," Prepared by the Ground Water Protection Council and ALL Consulting, April 2009
  - Ground Water Protection Council Board of Directors
  - State Oil and Natural Gas Regulations Designed to Protect Water Resources
  - Letter from the Ohio Department of Natural Resources to the Ground Water Protection Council
  - Letter from the Pennsylvania Department of Environmental Protection to the Ground Water Protection Council
  - Letter from the New Mexico Energy, Minerals and Natural Resources Department to the Ground Water Protection Council
  - Letter from the State Oil and Gas Board of Alabama to the Ground Water Protection Council
  - Letter from the Railroad Commission of Texas to the Ground Water Protection Council
- Lamborn, Hon. Doug, a Representative in Congress from the State of Colorado, Statement submitted for the record by the American Exploration & Production Council, American Petroleum Institute, Independent Petroleum Association of America, International Association of Drilling Contractors,, Petroleum Equipment Suppliers Association, and U.S. Oil and Gas Association
- Lummis, Hon. Cynthia M., a Representative in Congress from the State of Wyoming, Wyoming State Legislature Hydraulic Fracturing Joint Resolution submitted for the record

