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HIGH PRICE OF NATURAL GAS

HEARING

BEFORE THE

COMMITTEE ON ENERGY AND NATURAL RESOURCES UNITED STATES SENATE

ONE HUNDRED EIGHTH CONGRESS

FIRST SESSION

TO DISCUSS THE REASONS BEHIND THE HIGH PRICE OF NATURAL GAS, ITS EFFECT ON THE ECONOMY, AND TO CONSIDER POTENTIAL SOLUTIONS

JULY 10, 2003

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HIGH PRICE OF NATURAL GAS

THURSDAY, JULY 10, 2003

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

The committee met, pursuant to notice, at 10:04 a.m. in room SH–216, Hart Senate Office Building, Hon. Pete V. Domenici, chairman, presiding.

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

The CHAIRMAN. The hearing will please come to order. I will tell you what I would like to do. One of the staffers—I know we have done the best we can, but I would like you to take that chart that is over there and sitting on the side and you would like to sit it up here at the table alongside of Dr. Greenspan so everybody can see it. Kind of turn it a little bit his way. There you go, and put it back just slightly, ma'am. There you go.

I guess, Dr. Greenspan, that is quite obvious: generating capacity brought on line by fuel type. And you can see that what is happening—that red line is what is happening the last few years to natural gas in terms of generating capacity brought on line by, the red one being natural gas; and you can see the earlier years, the various mixes that made up America's energy capacity.

With that, thanks, everyone, for coming. But in particular, thank you, Dr. Greenspan, for coming and for agreeing to appear. Your recent statements have brought much attention to, needed attention, to the issue of this Nation's growing dependence on natural gas and the resultant price increases that have occurred in recent years.

Gas-fired powerplants now account for 88 percent of new electric generation. In the increasingly deregulated electricity market, gas has become the fuel of choice—that is for generators—and that is because they seek low emissions, low capital costs, and until now low fuel cost generating technology.

But there are troubling signs. New reserves tend to be smaller than earlier discoveries and total reserves are depleting faster than ever before. You are quite right, if we have read your previous statements accurately, we are increasingly in need of importing gas in the form of liquefied natural gas. At current prices that is certainly apt to happen.

The additional demand for gas and corresponding price increases are causing particular concerns among industrial consumers of natural gas, for whom feedstock price sometimes represents 60 percent

of the total product cost. Those industries may be permanently affected if long-term prices remain where they are currently.

Mr. Chairman, I am advised that month-ahead gas prices will probably remain in the $4.50 to $9.00 range through this winter, with the deciding factor being how cold this winter is. I have talked to a variety of experts and I am convinced that there is not much the Government can do in the near term to affect that price by more than 25 cents in any direction, a negligible amount considering the effect the weather will have all by itself.

I believe there are two long-term answers: we must diversify our fuel mix by making coal, nuclear, and other fuels equally attractive for new electricity generation; and we must expand our capacity and access to domestic production and for LNG. Having said that, I would very much appreciate your views as to any changes that should be made to government policy going forward to address these very weighty issues so integral and important to our social wellbeing.

With that, we ask you, Mr. Chairman, if you will please talk with the committee. Your statement will be made a part of the record and after you have finished we will proceed to ask questions.

Dr. Greenspan.

[The prepared statements of Senators Bunning, Craig, Feinstein, and Murkowski follow:]

PREPARED STATEMENT OF HON. JIM BUNNING, U.S. SENATOR FROM KENTUCKY

Thank you Mr. Chairman.

This is a very important hearing that we are having today. I am pleased to have this opportunity to examine how we can more effectively deal with the price of natural gas.

Higher prices have placed a strain on the American family's budget and on manufacturers. Natural gas' high price has affected the bottom lines of many companies. This means that the jobs of many employees have also been put at risk.

I have heard from many companies in Kentucky who are upset about the price of natural gas. The high prices have made it more difficult for companies to continue their operations with a profit.

We need to act to reduce the economic burden of high natural gas prices on Americans.

One way to lower the cost of natural gas is to increase domestic supply. The increased demand for natural gas with little increased production over the past decade has contributed to the price problem.

Another way to lower the cost of natural gas is to go back to using other energy sources. With new technology, other sources of energy such as coal are cleaner burning fuels.

Finally, we must promote conservation of energy and increase the efficiency of natural gas use.

I look forward to hearing from our witnesses today and thank each of them for taking the time to come testify before us.

Thank you.

PREPARED STATEMENT OF HON. LARRY E. CRAIG, U.S. SENATOR FROM IDAHO

Mr. Chairman, thank you for this opportunity to examine the current high price of natural gas and its impact on our economy.

I especially want to thank you for inviting Chairman Greenspan to help us work through this growing problem. His recent testimony before the House Energy and Commerce Committee highlighted some of the significant pressures that are contributing to the rigidity of natural gas supply and he offered constructive opinions on how we might avoid a full blown supply crisis. His suggestion to expand our use of Liquified Natural Gas is one worthy concept to explore. But I fear that siting LNG terminals will be exposed to the same opposition arrayed against other energy developments.

Today, I'm interested in exploring the simple interaction between demand, supply, and the forces that shape demand and supply. I, for some time now, have pointed to supply restrictions as the prime cause of the rigidity of natural gas supply. Indeed, following the Committee's vote on the energy bill last April, I went to the Floor in early May and expressed my belief that limitations on drilling on federal lands by constricting potential exploration options have made supply more inelastic.

When that factor is combined with the environmental pressures occurring largely in the 1990s to build power plants that are fueled by natural gas in order to economically comply with new source review regulations introduced in the 1970s, it is not hard to see why we are facing high prices for this increasingly valuable commodity.

Although the new source review compliance is a compelling pressure on natural gas use—and I note the recent New York State NSR settlement with the Mirant Corporation requiring more use of natural gas—there are other pressures complicating the transportation of natural gas that cannot be ignored, such as the current Millenium Pipeline Project controversy over New York's application of the Coastal Zone Management Act.

According to several energy industry analysts—and I am very interested in Chairman Greenspan's views on this—the focus on natural gas as the way to achieve environmental improvements without increasing power generation costs has had an unfortunate, and likely unforeseen and unintended, consequence of reducing the resiliency of natural gas markets.

These analysts conclude that:

> [R]egulatory mandates have constrained us away from being able to apply the lessons of portfolio diversification to our energy choices, and our inability to diversify our fuel input portfolios makes for markets that do not adapt to unanticipated and changing conditions.

The recent ratification and current implementation of the Kyoto Protocol in Canada I fear will compound and exacerbate this costly balkanization of fuel portfolios. As Chairman Greenspan stated in his House testimony, Canada is our major source of imported natural gas. Canada's implementation of Kyoto will require Canadian electricity generators to substitute natural gas for coal in order to meet carbon dioxide reduction targets that will be even more stringent by 2025.

Barring a substantial increase in Canadian production, there will be much less Canadian natural gas available for export to the United States. The dislocation to our natural gas market could be staggering.

All of these constraints will force us to look once again at our entire energy portfolio. Assistant Secretary David Garman is here from the Department of Energy to provide testimony on how near term increases in efficiency and energy conservation can ease the squeeze on natural gas supplies. This is a near term, and in my view, no regrets kind of strategy.

On a much longer term horizon, I hope also that our witnesses will address the expanded use of nuclear energy—something I am a strong proponent of. The Senate energy bill contains provisions which support the expanded use of nuclear energy. Nuclear plants are fueled for a year or two at a time. Since fuel costs make up a smaller percentage of the cost of nuclear power, these plants can shield consumers from the kind of rampant price volatility that we are predicting in natural gas markets. While these nuclear provisions are a longer term investment in energy security, they are essential and we must stay focused on their importance.

Given the growing tightness in natural gas supply and the intensifying environmental pressures in our country to move away from coal and oil as a fuel source, what set of criteria or questions should guide us in determining national energy goals that assist in growing our economy?

Shouldn't Congress develop those national energy goals for the purpose of ensuring our nation's global competitiveness and national security in an ever changing geopolitical world—a world that contains developing nations such as China and other Asian countries that present considerable current and future threats to our economic well-being?

A key question that I'm sure will be addressed during consideration of this Committee's energy bill on the Senate Floor later this month is whether we can or should substantially reduce coal use in this country when we have over 250 years of domestic supply? Coal currently accounts for over 50 percent of our cheapest electricity generation.

Another important question is whether we should now pass energy legislation that continues the trend to pressure more use of natural gas and even higher gas prices?

We must have a clear understanding of how the answers to these questions effect our economy and it is a real pleasure to have Chairman Greenspan with us today to help us ensure that we do clearly understand the consequences of our actions.

I look forward to his wise counsel and also to the views of the other witnesses you have invited to testify today.

Thank you, Chairman Domenici.

PREPARED STATEMENT OF HON. DIANNE FEINSTEIN, U.S. SENATOR FROM CALIFORNIA

Mr. Chairman thank you very much for holding this hearing. I am very concerned about the natural gas situation and in particular I am interested to discuss how we can reduce our consumption of natural gas and increase our capacity to import liquified natural gas or LNG.

Mr. Chairman, in March, after a year-long investigation, the Federal Energy Regulatory Commission released its "Final Report on Price Manipulation in Western Markets" which confirmed widespread and pervasive fraud and manipulation during the Western Energy Crisis.

One of the key findings by the Commission was that natural gas and electricity are "inextricably linked, and that dysfunctions in each fed off one another during the [Western Energy] crisis."

The day after the FERC report was issued all three Commissioners came before this Committee to testify. I agree with Chairman Pat Wood and Commissioner Bill Massey who both made it very clear that the Energy bill presents an opportunity for Congress to enact more consumer protections and provide greater authority to the Commission so that FERC can be a more effective regulator.

I asked Chairman Wood, "Doesn't it make sense to establish the same penalties and refund authority to deter fraud and manipulation in the natural gas sector since FERC found that markets for natural gas and electricity are inextricably linked?"

Chairman Wood answered "YES" and Commissioner Massey also testified in support of harmonizing the refund and penalty provisions in the Natural Gas Act with the Federal Power Act.

As Commissioner Massey said, "If the Commission is to be the cop on the beat of competitive markets, we must have the tools needed to ensure good behavior. Refunds alone are not a sufficient deterrent against bad behavior. The consequences of engaging in prohibited behavior must be severe enough to act as a deterrent."

In January of this year, FERC issued its natural gas market assessment, which concluded that market manipulation has been occurring and may be likely to occur in the future. The Commission found that manipulation is possible in the natural gas markets if companies:

- use market power to manipulate prices in physical markets; and
- use information about capacity availability to take positions in a marketplace more advantageous than their competitors.

Westerners have seen evidence of this type of manipulation quite recently and this illegal behavior forced the price of natural gas to soar in California.

In September, an Administrative Law Judge at FERC issued a landmark ruling concluding that El Paso Corporation withheld natural gas from California, illegally exercised market power, and violated its certificate obligations.

FERC Judge Curtis L. Wagner recommended penalty proceedings against El Paso because of the following findings:

- "El Paso Pipeline withheld extremely large amounts of capacity that it could have flowed to its California delivery points . . . which substantially tightened the supply of natural gas at the California border."
- "El Paso Pipeline had the ability to exercise market power and that El Paso Pipeline did in fact exercise market power by withholding substantial volumes of capacity to its California delivery points, which tightened the supply."

High natural gas prices played a significant role in the Western Energy Crisis. Since much of the electricity generated within California is fueled by natural gas, when natural prices soared, so did electricity prices. Since El Paso carries most of the natural gas to Southern California, the company was able to exercise unprecedented market power to drive up the price of natural gas.

Let me mention some additional specific findings by the FERC Administrative Law Judge Against El Paso:

- "El Paso failed to post and make available at least 345 million cubic feet per day of available capacity at its California delivery points. Consequently, the record in this case now demonstrates an exercise of market power by El Paso Pipeline."
- El Paso Pipeline and El Paso Merchant Energy were guilty of affiliate self-dealing.
- "El Paso Pipeline never requested authority to abandon any portion of [its] certificated capacity. El Paso Pipeline was under an obligation to make 3,290 million cubic feet per day available to its California delivery points. . . . Since the average flow during the relevant period was only 2,594 million cubic feet per day, there was a withholding of 696 million cubic feet per day to the California delivery points. . . . The Chief Judge finds this failure to operate at or near Maximum Allowable Operating Pressure constitutes a clear withholding of available capacity by El Paso Pipeline, and is a clear violation of its duty to fulfill its certificate obligation."

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

Thank you, Mr. Chairman, for convening this important hearing to examine the impact of high natural gas prices on the economy.

This issue is already impacting businesses in many regions of the country, including in my state of Alaska. Companies that rely on natural gas as a feedstock for their production are currently facing very difficult decisions. They are deciding whether they can afford to continue production or whether they must lay off employees. Agrium, Inc. a large manufacturer of fertilizer in Kenai, Alaska is facing just this problem.

Unfortunately, companies like Agrium face serious risks even if they reduce production for a short period of time in hopes that the price of natural gas will eventually come down. The customers they provide fertilizer to will not disappear, at least we hope they won't disappear. If they continue to buy fertilizer they may be forced to find other suppliers—most likely outside the U.S. That is bad for U.S. jobs and our farmers and the overall economy.

At worst, companies like Agrium may lose permanent market share if prices remain too high for too long. A secure, abundant and reasonably priced supply of natural gas is critical to our economy.

Indeed, Chairman Greenspan recognized this in his recent Congressional testimony before the House Commerce Committee in June. Natural gas currently represents almost a quarter of all energy consumed in the United States. It heats 50 percent of existing homes and nearly 70 percent of newly built homes. Consumers who are used to reasonable natural gas bills may soon find they are unable to pay their bills, especially as contracts come up for consumers who are on the budget plans that are based on last year's gas prices.

An additional $300 per month in energy bills is a car payment for many families. It is bad for the economy when they have to decide against buying a new car, or against putting that $300 dollars per month into their retirement accounts or their kids' college savings account.

Access to more of the resource is key. That is one reason why I am pushing so hard to build the Alaska Gas Pipeline, because Alaska has huge amounts of gas that can help the U.S. meet its needs. In addition, Alaska's gas can be transported to the Lower 48 as LNG. While Chairman Greespan notes in his testimony that LNG would play a significant factor in meeting U.S. gas supplies into the future, I want to make sure people remember Alaska already produces some LNG for export, and more could be made available for LNG exports to the West Coast if we can get this project going.

STATEMENT OF ALAN GREENSPAN, CHAIRMAN, BOARD OF GOVERNORS, FEDERAL RESERVE SYSTEM

Dr. GREENSPAN. Thank you very much, Mr. Chairman.

Today's tight natural gas markets have been a long time coming and distant futures prices suggest that we are not apt to return to earlier periods of relative abundance and low prices any time soon.

It was little more than a half century ago that drillers seeking valuable crude oil bemoaned the discovery of natural gas. Given the lack of adequate transportation, wells had to be capped or gas

flared. As the economy expanded after World War II, the development of a vast interstate transmission system facilitated widespread consumption of natural gas in our homes and business establishments. On a heat-equivalent basis, natural gas consumption by 1970 had risen to three-fourths that of oil. But consumption lagged in the following decade because of competitive incursions from coal and nuclear power.

Since 1985, natural gas has gradually increased its share of total energy use and is projected by the Energy Information Administration to gain share over the next quarter century owing to its status as a clean-burning fuel.

Recent years' dramatic changes in technology are making existing energy reserves stretch further, while keeping long-term energy costs lower than they otherwise would have been. Seismic techniques and satellite imaging, which are facilitating the discovery of promising new natural gas reservoirs, have nearly doubled the success rate of new field wildcat wells in the United States during the past decade. New techniques allow far deeper drilling of promising fields, especially offshore.

The newer recovery innovations reportedly have significantly raised the average proportion of gas reserves eventually brought to the surface. Technologies are facilitating Rocky Mountain production of tight sands gas and coalbed methane. Marketed production in Wyoming, for example, has risen from 3.4 percent of total U.S. output in 1996 to 7.1 percent last year.

Moreover, improving technologies have also increased the depletion rate of newly discovered gas reservoirs, placing a strain on supply that has required increasingly larger gross additions from drilling to maintain any given level of dry gas production. Depletion rates are estimated to have reached 27 percent last year, compared with 21 percent as recently as 5 years ago.

The rise has been even more pronounced for conventionally produced gas because tight sands gas, which comprises an increasing share of new gas finds, exhibits a slower depletion rate than conventional wells.

Improved technologies, however, have been unable to prevent the underlying long-term price of natural gas in the United States from rising. This is most readily observed in markets for natural gas where contract delivery is sufficiently distant to allow new supply to be developed and brought to market. That price has risen gradually from $2 per million Btu in 1997 for delivery in the year 2000 and presumably well beyond, to more than $4.50 for delivery in 2009, the crude oil heating equivalent of rising from less than $12 per barrel to $26 per barrel. Those prices, incidentally, are as of the close of yesterday.

Over the same period, the distant futures price of light sweet crude oil has edged up only $4 per barrel and is selling at a historically rare discount to comparable dated natural gas.

Because gas is particularly challenging to transport in its cryogenic form as a liquid, imports of liquefied natural gas have been negligible. Environmental and safety concerns and cost have limited the number of LNG terminals and imports of LNG. In 2002 such imports accounted for only 1 percent of total U.S. gas supply.

Canada, which has recently supplied a sixth of our consumption, has little capacity to significantly expand its exports, in part because of the role that Canadian gas plays in supporting growing oil production from tar sands.

Given notable cost reductions for both liquefaction and transportation of LNG, significant global trade is developing and high gas prices projected in the American distant futures market have made us a potential very large importer. Worldwide imports of natural gas in 2002 were only 23 percent of world consumption, compared to 57 percent for oil.

Even with markedly less geopolitical instability confronting world gas than world oil in recent years, spot gas prices have been far more volatile than those for oil, doubtless reflecting in part less developed price-dampening global trade.

The updrift and volatility of the spot price for gas have put significant segments of the North American gas-using industry in a weakened competitive position. Unless this competitive weakness is addressed, new investment in these technologies will flag.

Increased marginal supplies from abroad, while likely to notably damp the levels and volatility of American natural gas prices, would expose us to possibly insecure sources of foreign supply, as it has for oil. But natural gas reserves are somewhat more widely dispersed than those of oil, for which three-fifths of proven world reserves reside in the Middle East. Nearly two-fifths of world natural gas reserves are in Russia and its former satellites and one-third are in the Middle East. Creating a price pressure safety valve through larger import capacity of LNG need not unduly expose us to potentially unstable sources of imports.

There are still numerous unexploited sources of gas production in the United States. We have been struggling to reach an agreeable tradeoff between environmental and energy concerns for decades. I do not doubt we will continue to fine-tune our areas of consensus, but it is essential that our policies be consistent. For example, we cannot on the one hand encourage the use of environmentally desirable natural gas in this country while being conflicted on larger imports of LNG. Such contradictions are resolved only by debilitating spikes in price.

In summary, the long-term equilibrium price for natural gas in the United States has risen persistently during the past 6 years, from approximately $2 per million Btu to more than $4.50 today. Although futures markets project a near-term modest price decline from current highly elevated levels, contracts written for delivery in 2009 are at prices more than double the levels that had been contemplated when much of our existing gas-using capital stock was put in place.

The perceived tightening of long-term demand-supply balances is beginning to price some industrial demand out of the market. It is not clear whether these losses are temporary, pending a fall in price, or permanent. Such pressures do not arise in the U.S. market for crude oil. American refiners have unlimited access to world supplies, as was demonstrated most recently when Venezuelan oil production shut down. Refiners were able to replace lost oil with supplies from Europe, Asia, and the Middle East.

If North American natural gas markets are to function with the flexibility exhibited by oil, unlimited access to the vast world reserves of gas is required. Markets need to be able to effectively adjust to unexpected shortfalls in domestic supply.

Access to world natural gas supplies will require a major expansion of LNG terminal import capacity and development of the newer offshore regasification technologies. Without the flexibility such facilities will impart, imbalances in supply and demand must inevitably engender price volatility. As the technology of LNG liquefaction and shipping has improved and as safety considerations have lessened, a major expansion of U.S. import capability appears to be under way. These movements bode well for widespread natural gas availability in North America in the years ahead.

Thank you very much, Mr. Chairman. I look forward to your questions.

[The prepared statement of Dr. Greenspan follows:]

PREPARED STATEMENT OF ALAN GREENSPAN, CHAIRMAN, BOARD OF GOVERNORS, FEDERAL RESERVE SYSTEM

Today's tight natural gas markets have been a long time in coming, and distant futures prices suggest that we are not apt to return to earlier periods of relative abundance and low prices anytime soon. It was little more than a half-century ago that drillers seeking valuable crude oil bemoaned the discovery of natural gas. Given the lack of adequate transportation, wells had to be capped or the gas flared. As the economy expanded after World War II, the development of a vast interstate transmission system facilitated widespread consumption of natural gas in our homes and business establishments. On a heat-equivalent basis, natural gas consumption by 1970 had risen to three-fourths of that of oil. But consumption lagged in the following decade because of competitive incursions from coal and nuclear power. Since 1985, natural gas has gradually increased its share of total energy use and is projected by the Energy Information Administration to gain share over the next quarter century, owing to its status as a clean-burning fuel.

Recent years' dramatic changes in technology are making existing energy reserves stretch further while keeping long-term energy costs lower than they otherwise would have been. Seismic techniques and satellite imaging, which are facilitating the discovery of promising new natural gas reservoirs, have nearly doubled the success rate of new-field wildcat wells in the United States during the past decade. New techniques allow far deeper drilling of promising fields, especially offshore. The newer recovery innovations reportedly have significantly raised the average proportion of gas reserves eventually brought to the surface. Technologies are facilitating Rocky Mountain production of tight sands gas and coalbed methane. Marketed production in Wyoming, for example, has risen from 3.4 percent of total U.S. output in 1996 to 7.1 percent last year.

Moreover, improving technologies have also increased the depletion rate of newly discovered gas reservoirs, placing a strain on supply that has required increasingly larger gross additions from drilling to maintain any given level of dry gas production. Depletion rates are estimated to have reached 27 percent last year, compared with 21 percent as recently as five years ago. The rise has been even more pronounced for conventionally produced gas because tight sands gas, which comprises an increasing share of new gas finds, exhibits a slower depletion rate than conventional wells.

Improved technologies, however, have been unable to prevent the underlying long-term price of natural gas in the United States from rising. This is most readily observed in markets for natural gas where contract delivery is sufficiently distant to allow new supply to be developed and brought to market. That price has risen gradually from $2 per million Btu in 1997 for delivery in 2000, and presumably well beyond, to more than $4.50 for delivery in 2009, the crude oil heating equivalent of rising from less than $12 per barrel to $26 per barrel. Over the same period, the distant futures price of light sweet crude oil has edged up only $4 per barrel and is selling at a historically rare discount to comparably dated natural gas.

Because gas is particularly challenging to transport in its cryogenic form as a liquid, imports of liquefied natural gas (LNG) have been negligible. Environmental and safety concerns and cost have limited the number of LNG terminals and imports

of LNG. In 2002, such imports accounted for only 1 percent of U.S. gas supply. Canada, which has recently supplied a sixth of our consumption, has little capacity to significantly expand its exports, in part because of the role that Canadian gas plays in supporting growing oil production from tar sands.

Given notable cost reductions for both liquefaction and transportation of LNG, significant global trade is developing. And high gas prices projected in the American distant futures market have made us a potential very large importer. Worldwide imports of natural gas in 2002 were only 23 percent of world consumption, compared to 57 percent for oil.

Even with markedly less geopolitical instability confronting world gas than world oil in recent years, spot gas prices have been far more volatile than those for oil, doubtless reflecting, in part, less-developed, price dampening global trade. The updrift and volatility of the spot price for gas have put significant segments of the North American gas-using industry in a weakened competitive position. Unless this competitive weakness is addressed, new investment in these technologies will flag.

Increased marginal supplies from abroad, while likely to notably damp the levels and volatility of American natural gas prices, would expose us to possibly insecure sources of foreign supply, as it has for oil. But natural gas reserves are somewhat more widely dispersed than those of oil, for which three-fifths of proved world reserves reside in the Middle East. Nearly two-fifths of world natural gas reserves are in Russia and its former satellites, and one-third are in the Middle East.

Creating a price-pressure safety valve through larger import capacity of LNG need not unduly expose us to potentially unstable sources of imports. There are still numerous unexploited sources of gas production in the United States. We have been struggling to reach an agreeable tradeoff between environmental and energy concerns for decades. I do not doubt we will continue to fine-tune our areas of consensus. But it is essential that our policies be consistent. For example, we cannot, on the one hand, encourage the use of environmentally desirable natural gas in this country while being conflicted on larger imports of LNG. Such contradictions are resolved only by debilitating spikes in price.

In summary, the long-term equilibrium price for natural gas in the United States has risen persistently during the past six years from approximately $2 per million Btu to more than $4.50. Although futures markets project a near-term modest price decline from current highly elevated levels, contracts written for delivery in 2009 are more than double the levels that had been contemplated when much of our existing gas-using capital stock was put in place. The perceived tightening of long-term demand-supply balances is beginning to price some industrial demand out of the market. It is not clear whether these losses are temporary, pending a fall in price, or permanent.

Such pressures do not arise in the U.S. market for crude oil. American refiners have unlimited access to world supplies, as was demonstrated most recently when Venezuelan oil production shut down. Refiners were able to replace lost oil with supplies from Europe, Asia, and the Middle East. If North American natural gas markets are to function with the flexibility exhibited by oil, unlimited access to the vast world reserves of gas is required. Markets need to be able to effectively adjust to unexpected shortfalls in domestic supply. Access to world natural gas supplies will require a major expansion of LNG terminal import capacity and development of the newer offshore regasification technologies. Without the flexibility such facilities will impart, imbalances in supply and demand must inevitably engender price volatility.

As the technology of LNG liquefaction and shipping has improved, and as safety considerations have lessened, a major expansion of U.S. import capability appears to be under way. These movements bode well for widespread natural gas availability in North America in the years ahead.

The CHAIRMAN. Thank you very much, Mr. Chairman.

We will now follow the 5-minute rule, excepting for Senator Bingaman, who will be allowed as much time as he desires. All will then follow with 5 minutes each.

Mr. Secretary, I have three questions. I will try to make them brief. First, in February the committee held the last hearing on natural gas when the price spiked to $9 per Mcf and there were accusations that the market was being manipulated. Although prices have come down since our last hearing, prices are more than double where they were last year.

My question is: Do you see any manipulative behavior in the market or are the sustained high prices the result of legitimate forces at work in the market?

Dr. GREENSPAN. Mr. Chairman, as best I can judge the spikes that we have observed and indeed the levels of natural gas prices we are now finding in our markets can be fully explained by the relative balances of supply and demand as they have developed over the last several years. Manipulation is a very difficult thing to ferret out. I can say this, that you do not need to advert to manipulation to understand what is going on, and I would suspect that a vast amount of people who try to manipulate these markets indeed fail.

The CHAIRMAN. My second question has to do with another matter I noted in my opening remarks. I believe that there is very little that can be done in the short term to relieve the high prices of natural gas. At best, new production will take 3 to 6 months to get to market, demand management is likely to provide modest savings, and fuel-switching is severely limited. I believe our policy options should focus, however, on diversifying our fuel mix, expanding our access to domestic productions, and LNG.

Do you agree with this assessment or are there other specific short-term policy alternatives that have not been considered? If there are, what might they be?

Dr. GREENSPAN. Mr. Chairman, I agree with your assessment. I am not aware of any short-term expedients that can be employed at this stage to significantly alter the path that will occur in prices over the next 6 to 9 months or a year. Weather will be the major factor, frankly, which will determine the price patterns that occur.

The CHAIRMAN. I do want to comment just as an observation, something you are fully aware of. I had a visit within the last week by a major American manufacturer of chemical products, I guess the world's largest. I was absolutely shocked to hear the president and CEO say that the price of natural gas is so high here that they are moving production to Germany—I could hardly believe it—for the production of chemical products that require natural gas as a base.

I conclude that he has to be right or he would not be saying it, which means that, in addition to our domestic prices at our households, where we are seeing these bills go up, which people are very upset about, this is a huge potential jobs issue for the United States if we cannot rectify it as soon as possible. Is that correct?

Dr. GREENSPAN. Well, it is certainly the case that natural gas, as differentiated from oil, can have major regional price differences. You cannot have them in oil because we can transport oil and arbitrage markets around the world and do. So when you get major price increases in crude oil, you do not get differential international competitive pressure because everyone is looking at the same price.

But today we are looking at price levels—for example, the spot price is now somewhat over $5 per million—Mcf—or Btu's, which is roughly the same. It is half that or just a little more than half in Europe, even in the spot markets of the United Kingdom. So it is not that we are looking at a world shortage of natural gas. We are looking at a domestic problem and one which is undoubtedly the basis for the type of comments you heard from your friend.

The CHAIRMAN. Have you analyzed the overall impact to the economy of our country and quantified in any way—and I can understand it if you have not—the number of jobs that will be lost if gas prices do not decline or stabilize, and what do you foresee for the future?

Dr. GREENSPAN. It is very difficult to make that judgment. I mean, we do see the obvious loss of jobs that will go with the inevitable movement of gas-using productive capacity to foreign shores because it has made us largely uncompetitive in a number of industries in which gas is a very critical input.

It has not happened yet. In other words, we do see significant reductions in production in certain very specific high gas-using areas, but aside from the switches that we have seen from gas to residual fuel oil or coal where those exchanges are possible, you do not see all that much direct economic impact except in households. We are going to clearly see significantly higher bills if the futures markets in fact are correct forecasts of the spot market as we go into the winter.

The CHAIRMAN. Thank you very much.

Senator Bingaman.

Senator BINGAMAN. Thank you very much for being here and thank you for speaking out on this issue. I do think it is very important that the country focus on it and the Congress focus on it.

There is an interesting article in the morning *Washington Post* which, while recognizing that supply and demand considerations are largely responsible for the relatively high price of natural gas, the article tries to make the point that a secondary factor contributing to the high price of natural gas may be the lack of liquidity and lack of confidence in the markets for natural gas as a result of Enron, the collapse of Enron, and other traders exiting that market.

There is a quotation from Christine Teezak, who is an energy analyst with Schwab Capital Markets, saying that: "Having fewer traders in the market means there are fewer offers to buy and sell. Instead of rising in small steps, natural gas prices are jumping by bigger increments."

I wondered if you had any thoughts as to whether this lack of liquidity and the pulling back of a lot of companies from the trading in this area has been a factor in the current prices.

Dr. GREENSPAN. It has likely been a factor, but it is unquestionably quite small because, as I mentioned to the chairman a minute ago, there is very little in the price patterns that we are recently seeing which is just not fully explained by the balance of aggregate supply and demand.

Remember, what happens in markets which are illiquid is that you have a number of quasi-monopolistic positions where individuals can get somewhat higher prices than they would otherwise get in a market in which there was fully competitive movement of product. You do not have that, for example, in the Chicago wheat markets. You have it in areas where inventories are rather difficult to create or are virtually nonexistent.

Electric power has no inventory capability to speak of, with the rare exception of backing up in some hydroelectric reservoirs for short periods. Natural gas has got inventories, but they are very

difficult to manage because we are dealing with an ephemeral product. As a consequence of that, inventory management is more difficult than it is, for example, with wheat or copper or anything else, and unless you get liquidity in those markets you do have the capacity for local monopoly niches which can eke out a slightly higher price.

But my guess over the long run is that effect is really quite de minimis.

Senator BINGAMAN. Let me ask—this was sort of dealt with, I think, in your statement, but I can remember about 15 years ago I started getting concerned about the rising current account deficit and imbalance in trade between ourselves and the rest of the world. Of course, it has continued to grow or is certainly at a very high level now.

But I remember asking someone from the Commerce Department, I think, to come over and brief me on what the administration was doing about that. This was back in the mid-eighties. The response I got was interesting. He said: "You know, a lot of that, that trade imbalance that you are looking at, is structural and we cannot do anything about it."

I said: "Well, what do you mean, structural"? And he said: "It is oil and we are dependent on foreign oil in a very big way and that is a permanent part of our trade imbalance."

It sounds to me like what you are suggesting is that as we become a larger and larger importer of LNG we will be building into our trade relationship with the rest of the world another so-called structural trade imbalance that could have adverse consequences for us going forward, and I would be interested in your thoughts as to whether or not we are essentially adopting policies that will, by encouraging more use of natural gas, and encouraging more importation of LNG and we are setting ourselves up for another long-term structural deficit.

Dr. GREENSPAN. Senator, I do not know who the economist or official was or what his reasons were. But just remember, at the same time, or even now, the Japanese have had, and have very large surpluses and they import all their oil. So that cannot be the explanation.

It is true there are structural problems with respect to American trade in the sense that our propensity to import goods and services relative to our income is higher than our trading partners' and that if you consider what the world economy would look like if everyone were growing at the same rate, we would have a progressively increasing trade deficit. So that there are structural problems involved.

I cannot say that you can argue that energy is specific to that, because you go around the world and we are in somewhat better shape than most of our trading partners who have surpluses.

The size of what we are talking about with respect to increasing imports of natural gas is not all that large. I would say that I would prefer that we not increase imports of natural gas. I would like to see a facility available to have the flexibility to use it when we need it. But I would much prefer that we met domestic consumption with effectively North American production.

But I regret to say that the problems that are emerging in endeavoring to do that suggest that we may be using LNG for more than just price stability. We may be using it for base supply of natural gas in the years ahead, unless we can find means to create a domestic, and that would mean a U.S. source, because the Canadians are increasingly less likely to be able to fill in our growing need for gas, especially in the context of that chart, if you extended it, it would continue the red lines for quite a while.

Senator BINGAMAN. Let me just ask one other question that relates to this provision that we have in the energy bill this year, that we are considering in the Senate floor, and in provisions we have reported out of the Finance Committee to try to encourage the construction of a pipeline to bring natural gas from the North Slope of Alaska.

Have you looked at the question of to what extent that might alleviate some of the price pressures that we are anticipating in the future? I know it would be many years after a decision was made to construct that pipeline before we would actually see any guess coming from the North Slope down to the Lower 48. But long term, I have thought that that would be a partial solution to the anticipated high price of natural gas.

Do you agree with that or not?

Dr. GREENSPAN. Unquestionably, the more gas we get down into the lower 48 the better. I think that we are going to find significant amounts of Alaskan gas coming down, either through a pipeline or, as your Senate colleague from Alaska mentioned, through LNG exports from, if you want to put it the way, from Alaska to the lower 48.

I do not believe that one needs to encourage that. I mean, with long-term $4.50 gas, the profitability in doing that is quite adequate by any measure, and indeed the MacKenzie Delta project that is the development of a pipeline from the Canadian MacKenzie Delta into the lower 48, is going forward as best I understand it with minimal to no subsidies at all. It is a fully commercial project.

Senator BINGAMAN. Thank you.

The CHAIRMAN. Thank you very much, Senator Bingaman.

I did want to ask. If it is all right with the committee, what I have chosen to do is to follow the format of calling on Senators as of time of arrival. Is that satisfactory?

[No response.]

The CHAIRMAN. If that is the case, I will proceed on that basis.

I will make one comment before I proceed to the next Senator, which is Senator Murkowski. The Senate is now on record that we will take up the energy bill on the last week of this session before we go out for recess. We will start on Monday and the Leader has announced, for at least the fifth time to my recollection this morning, that we will stay until we complete it.

So if we plan recesses, we better make sure that we understand that we have got an energy bill to finish before we take those recesses. I believe the testimony we have heard today does not do much other than to add to the importance that we do that.

Having said that, Dr. Greenspan, there are people certainly in this crowd who are LNG advocates, owners, proprietors, and they may not agree with your testimony. They may perceive that LNG

should become an integral ongoing part of America's solution. I would like to comment as chairman. My own feeling is that your observations are correct, but the market will have something to do with that, I am sure, as will the environment.

Having said that, I would now call on—this is the list: Senators Murkowski, Campbell, Craig, Thomas, Burns, Alexander, Bayh, Bunning, Dorgan, and Landrieu. Please proceed, 5 minutes each.

Senator MURKOWSKI. Thank you, Mr. Chairman.

Mr. Chairman, welcome and thank you for your comments. I particularly appreciate your remarks regarding Alaskan natural gas and our ability, I believe, to help address the shortages that we are facing as a Nation.

I want to talk a little bit about energy security initially. I agree with your comments, when we are talking about LNG and imports, that world gas supplies are different than the world oil supplies. They are more spread out, and a recognition that, I think to use your terms, they are more dispersed and I think your comment was that as an energy security issue it is not as—it is not the same situation as with oil.

But I think we need to recognize that those situations can change, and as we use our gas for feedstocks and electricity and heating that the international dynamics of some of our gas-rich nations can change. Those countries that we might have good relationships with today might not necessarily maintain those good relationships 25, 30 years from now and we may place ourselves in a situation where we are reliant on these countries who could be construed then as unsecure sources, but we have placed ourselves in a situation of reliance for our gas supplies, as we have currently with oil.

I get concerned that as a country we are moving towards a policy that could make us more dependent on foreign sources of gas, as we currently are with foreign sources of oil. So my question to you is why, other than as a source of cheap gas, should we pursue a policy that will make us more dependent on foreign gas now when we do have the resources within our country to at least delay some of our dependence on foreign sources?

Dr. GREENSPAN. Senator, for two reasons. First, I certainly agree with you that any commodity which we import is subject to insecure sources of supply and indeed over the years we have run into difficult problems. I remember when we had platinum and palladium problems because they were very heavily Soviet Union types of commodities and we were in some difficulty.

But the problem rests with the question of an overall policy. If we choose to emphasize environmentally efficient energy sources, which necessitates by merely the physics and chemistry of what we are dealing with that we employ very significant amounts and growing amounts of natural gas, then the question is we have to be prepared, if we do not wish to be dependent on any foreign natural gas, to find ways of producing it internally.

We did not have a problem with crude oil in this country up until about 1970, because we had shut-in capacity in the Texas Gulf, and indeed the Texas Railroad Commission rationed the production of U.S. crude oil and as a consequence of that we found that we had far more capacity domestically than we needed.

That changed, obviously, in 1970 and beyond. But we have got that same sort of problem confronting us today in natural gas. If we can find a means to assure that we will have a surplus of gas and capped wells because of the excess supply versus demand or facilities of, say, very significant amounts of LNG storage, for example, we can function in this market with non-volatile or stable prices, low internationally viable prices, competitive prices I should say, and a less volatile pattern of prices.

But unless we can assure that, the fallback position is in my judgment only LNG. That does not mean that we need to have a significant base, as I indicated earlier, of LNG as a fundamental source of supply, but it does mean that unless we create adequate domestic sources of supply.

The way I look at it is, first of all, the degree of price volatility and spikes I would consider unacceptable, unacceptable in that you cannot invest in that type of environment for gas-using facilities, and it makes internal corporate planning exceptionally difficult. The only way to eliminate is to make sure that you have a safety valve in markets where inventories are very difficult to hold, and if you have that safety valve then you will get smooth, non-volatile pricing and a risk structure which enables competitive capital investment in gas-using establishments.

However, if we cannot be sure we have got that, LNG is the ultimate safety valve, even if we do not use it. So my argument is that we have not exhibited in this country an obvious success in resolving a lot of these problems and, rather than say we shall do so, I think it would be far more sensible to assure ourselves at a minimum a backup facility which will provide us in the event of need and hope that that need is de minimis.

Senator MURKOWSKI. Mr. Chairman——

The CHAIRMAN. The Senator's time has expired.

Senator MURKOWSKI. Okay. I just wanted you to comment on the Alaska LNG and whether or not that was factored into, when you discuss LNG imports, how Alaska LNG is being factored into the equation.

Dr. GREENSPAN. Well, I think, Senator, as you know, there is a facility that produces LNG in Alaska, with a big chunk of it being shipped to Japan. I would say to the extent that one can bring Alaska gas down through LNG to the lower 48, I would say that may very well turn out to be a highly profitable activity. And I would suspect that if you do not have regulations which inhibit the flow of capital that is what is going to happen.

Senator MURKOWSKI. Thank you, Mr. Chairman.

The CHAIRMAN. Senator Campbell.

Senator CAMPBELL. Thank you, Mr. Chairman.

Dr. Greenspan, you did say you prefer, as many of us do, that we increase domestic production of natural gas. I certainly agree with that. But one of the big problems we have, of course, is that we all know that government does not produce gas any more than it does oil. Private industry does that, and they only do it if there is some kind of an incentive.

Usually the incentive is going to be the profit margin. I am sure they are all very patriotic, but they have got stockholders that they

have to satisfy. If there is no profit margin or no reason for doing it, they will not.

Much of the gas, like oil, is done on public lands and what I think the gas companies are facing is basically when they try to increase the domestic production, it mirrors what the domestic oil companies face and that is environmental opposition through lawsuits. In fact, in January of this year Peter Morton of the Wilderness Society declared: "If you bid a lease on public land, you can expect environmental litigation."

Well, a good deal of our natural gas is on public lands. So I do not know if you are really prepared to have an answer for this, but maybe you could give us a suggestion on how, what we ought to be doing in Congress to make it easier to increase that domestic production when we obviously are going to face environmental opposition at every turn?

Dr. GREENSPAN. Senator, we are confronted with a very unusual situation here, in the sense that there are two value systems, the economic value system and the environmental value system, and there is no tradeoff. There is a tradeoff in that part where they merge on issues of health, where you can really determine what type of effluent creates various difficult problems with the Nation's health.

But there is a very fundamental value which all human beings I think are attracted to, the pristine nature of a wilderness. When I go out West into your area, Senator, Jackson Hole, it is a very impressive sight. And there is no question that there are deep-seated human values that are involved in maintaining that type of environment the best we can.

But there are other human values on the economic side, and there is only one human being. In other words, we have got to make those tradeoffs. They are very difficult and if there was a ratio of one to the other or some form of mechanistic tradeoff that you could make to find an optimum balance, it would be easy. But on the issue of pristine wilderness versus economics there is no tradeoff. The only tradeoff is in human beings making that value judgment of what it is they want, and essentially it is up to the Congress to try to reflect that.

I mean, I have my own personal views, but other people have other views, and I think it is a very difficult but necessary tradeoff. What the tradeoff is, is to the extent that there is adequate gas and one need not worry about it, which has been the case in a good deal of our recent history, then there is no concern about the issue of the environmental tradeoff against the economics and the issue never came up. It has come up now and there is no simple alternative to recognize.

But no one is going to give you a mathematical equation which is going to say, putting these variables in, you will find that the optimum balance between pristine environmental issues and natural gas exploration and development is X. You will not get that.

Senator CAMPBELL. Thank you. I believe what have said is we in Congress are in for some intensive debates and difficult decisions. Thank you.

Thank you, Mr. Chairman.

The CHAIRMAN. Are you finished, Senator?

Senator CAMPBELL. Yes.

The CHAIRMAN. Senator Thomas.

Senator THOMAS. Thank you, Mr. Chairman.

Thank you, sir, for a very thoughtful presentation. I guess we are now on the verge of going back to talking about an energy policy. It seems to me that that is kind of what we lack, and I would be interested in knowing about that.

First of all, when you ask about access to public lands, remember it is not all wilderness. There is a great deal there that is not wilderness. There are various categories. So in order to do some of the things—you mentioned Wyoming as being a possibility—why, permitting is a problem. We have got to have transportation to get it out of there. Yes, there is gas there. We just have not been able to get it out for a number of reasons.

But more importantly, for instance coal. We have 250 years of coal available. It is far less expensive per Btu than is gas. What has happened is over the last number of years, why, practically all of the generation plants have been gas, largely because you can build gas plants smaller, put them closer to the market, and you do no have the transportation problem. There is concern about the environment part of coal, of course, but we can work on that.

Do you not think that one of the Government responsibilities is to have a policy as to where we ought to be in terms of what, for instance, maybe how we use these resources, and then have incentives to cause that policy to be implemented?

Dr. GREENSPAN. I certainly do, Senator. The issue of what one does with, say, Rocky Mountain gas reserves, which, as you know far better than I, are really quite extensive and would be a major contribution to the available domestic supply of gas, and there is no doubt that if we advert to coal for a good deal of our utility operation, or nuclear for that matter, it will take a good deal of pressure off the gas market.

It is difficult for an economist such as myself not to be more attracted to the economics than the wilderness issue, because that is my profession. But I would be mistaken to believe that that is the general view which everybody holds. I do say this: I say that it is essential that one recognizes what the cost in energy policy is if you restrict the access to certain areas where preliminary seismic analysis has indicated very significant capabilities in gas.

There are clearly improving coal technologies, coal gasification, coalbed methane, which so far as health concerns, which is another part of the environmental structure—I think people tend to lump what I would call pristine environmentalism and health environmentalism as though they are the same. They are not. They in themselves are two different sets of values.

On the issue of health, all I will say is that our history does suggest that as our wealth increased over the generations so did our health. The biggest increases in life expectancy in the United States occur when our economy is developing the capability of creating clean water and the ability to actually create an environment in which the atmosphere is breathable.

So you cannot really argue that it is a tradeoff. In one respect I would argue over the long run a viable economy may well be the most effective way to maintain the Nation's health. But that does

not mean that you do not have very significant and subtle tradeoffs which have got to be made, and there is no other vehicle in a democratic society to make those tradeoffs except the Congress.

Senator THOMAS. Thank you, and I hope that we can in our policy develop a better balance between protecting the economy and producing a product. I think that we can and I guess all that I am saying to you is I believe that one of our failures has been the lack of a policy to direct us to do those things. So thank you, sir.

The CHAIRMAN. Thank you very much, Senator.

Senator Burns.

Senator BURNS. Thank you, Mr. Chairman, and I will be very brief because you have covered most of the areas of interest, Chairman Greenspan.

I was interested in your comment today comparing all commodities, especially that of wheat in Chicago. There is one element that is left out of our ability to be competitive on the world market in exports and everything else in our production. There is another element that goes with natural gas that is very concerning in the agricultural community and that is the production of fertilizer.

Since agriculture is still our largest contributor to our GDP in this country, I think it goes without saying that it has to be a part of the economic makeup whenever we make our decisions in energy policy and how that affects our competitiveness in agricultural production. So I know I am not telling you anything new, but we very seldom hear it heard here in this 17 square miles of logic-free environment of what goes on in the rest of the country in the production of food and fiber, and I wanted to make that point and bring it to the attention of the committee and to the attention of the American consumer, because not only does it impair us to produce more efficiently, but also the ability to market and to keep our commodity within the range of everybody that is hungry.

Going on the other—you may want to comment on that.

Dr. GREENSPAN. No, no. I agree with you fully, Senator. I think that fertilizer happens to be one of the most gas-intensive products we produce, and I think that if you double the price on a fairly large acreage and that is a lot of cash.

Senator BURNS. It is tremendous.

Then the rules and regulations of getting coalbed methane on line and making it a part of the energy mix as far as natural gas is concerned, because they are of the same qualities environmentally and everything else. So we are very disappointed in my State after, 70 days after issuing a record of decision on the EIS in the Powder River Basin and the Tongue River Basin, this administration still has not issued one permit of Federal leases as far as drilling to start down there.

So those are the delays we encounter. They are not only expensive delays, but they are also—in the gas market, but also expensive to those people who are charged with the ability of lifting that resource.

Dr. GREENSPAN. Senator, the most expensive part of that is the rise in risk premiums that occur as a consequence of the uncertainty of the supervisory regulatory process that we go through. So that whatever we can do to bring the level of uncertainty down, the

more we are apt to lower the cost of capital on gas-using types of facilities.

Senator BURNS. I thank the chairman, and I thank the chairman for appearing today.

The CHAIRMAN. Thank you very much.

Senator Alexander.

Senator ALEXANDER. Thank you, Mr. Chairman.

Thank you, Mr. Greenspan, for being here. Your two paragraphs of comment before the Joint Economic Committee a few weeks ago on an emerging crisis on natural gas helped focus the country's attention on this problem in an important way and I thank you for that. We talked during that hearing, and I would like to continue that line of discussion now, on putting this in the focus of one word, which is "jobs."

The morning paper in Nashville said that the Nashville Gas Company has advised everyone who buys gas, business or residential, that gas prices this winter will be up at least 30 percent. There will be a witness from another company before us in a while where the management and the workers have taken a pay cut a few weeks ago, a few months ago, because of the higher price of natural gas.

It seems, at a time when our greatest challenge for our country longer term is how do we keep our manufacturing jobs from moving overseas, and we know that a big part of that is to try to keep unexpected costs low for those manufacturers so they will not move to Mexico or China or somewhere, these energy policies that we fail to adopt here are having a direct impact on everyday jobs.

Now, one kind others have talked about, which is we have restricted access to our own supply of natural gas. That has raised its price and that sends the jobs to Mexico and China. There may be another kind of regulatory policy which you might be able to help me understand better. I would like to go specifically to coal gasification, which is an obvious possible option for an alternative fuel to natural gas. It seems to work. That has been proven. The technology works. There is plenty of coal. The price of gas is now up, which ought to help an alternative fuel like coal gasification.

My question would be: Are there any regulatory barriers that we can fix that would make it easier for coal gasification to become an alternative fuel and help keep energy prices down and jobs—and keep jobs from moving overseas?

Dr. GREENSPAN. Incidentally, before I respond to that question let me correct a statement I made to Senator Burns. I said that the reduction in uncertainty would create improved investment for gas-using industries and I meant to say gas producers, obviously.

With respect to coal gasification, the technology has been around for quite a while, as you know. I am not familiar with the structure of regulation which is inhibiting it at this stage, but I am, obviously, aware of the essential negative aspect in all of our regulations, both current and pending, to the use of coal, use in any of its variations, because it is true, coal is carbon. I mean, that is what it is when you employ it.

So I am not sure exactly either what the state of the technology is or what the specific regulations are. But I would certainly agree with you that if there is a way to bring it forth, granted the ex-

traordinary amount of coal reserves that we have, that is something we should seek to do.

Senator ALEXANDER. One other question there. Many of the older powerplants have backup ability to produce fuel. Most of those older powerplants which are producing electricity by natural gas, if they were to switch to a backup fuel, would be producing electricity in a much dirtier way, a much more environmentally unacceptable way than they are today.

Have you studied that or taken into account the attitude we might take on that or the consequences of that?

Dr. GREENSPAN. Well, Senator, that gets back to the whole question of how we regulate the utilities. The problem with utilities, as I mentioned before, which is unique to electric power is that there is no capacity to have inventories, which enables one to effectively move production to the most efficient and the most environmentally appropriate forms of production.

So that gets back to the very complex structure of problems that everybody has been having with so-called electric power deregulation, which some say is misnamed and others say does not work. But you cannot, I believe, come to grips with the particular problem which you point to, which I think is a serious problem and one which the way you described it I think is quite accurate, until we come to grips with how we are going to create a viable competitive electric power system. And at the moment I think we have taken a few false steps and have not made very much progress or, to put it more exactly, have made far less progress than we should have made at this stage. There are areas of the country which are doing rather well in that regard.

Senator ALEXANDER. Thank you, Mr. Chairman.

The CHAIRMAN. Thank you very much, Senator.

Senator Bayh.

Senator BAYH. Thank you, Mr. Chairman, and thank you, Mr. Chairman. It is good to be with you again.

I hope I am not being unduly irreverent when I comment that a congressional hearing on the subject of natural gas may be the perfect meeting of venue and subject matter. It occurred to me that that may very well be the case.

You have touched upon most of my concerns. I would like to follow up on something that Senator Alexander was saying. As I understand the import of your testimony, it is your belief that the use of domestic coal reserves and possibly the further utilization of nuclear power could contribute substantially to the stability of energy production in the country and moderation of price increases in the country, but it involves the reconciliation of differing values: health concerns, environmental concerns on the one hand, economic growth concerns on the other hand.

He was asking you about coal and the production of electricity and that sort of thing. As we ramp up our ability to import LNG, does it make sense also to continue our investments or perhaps to expand them in such things as clean coal technology, which might allow us to reconcile the use of some carbon-based supplies that we have with environmental and health concerns?

Dr. GREENSPAN. Well, Senator, I believe we are doing that. There are innumerable endeavors to find a much better way of taking

particulates and a number of its less desirable gaseous products out of coal. I think that will continue.

I believe that we have got the potential of a very effective energy industry in this country and a very effective interface with the international energy system. We have got a number of bottlenecks, a number of things which we do poorly, and I would think that if we could allow competition far more sway in our markets I think we would find far quicker, cheaper, and more productive solutions.

It is remarkable what happens when you deregulate things. I remember, for example, when we took off all controls on petroleum in the early 1980's everyone was terribly concerned that prices would go out of hand, the system would collapse. And within a very short period of time the system was in balance.

I think we do too little of that in our energy policy these days, and what we find is we have a regulation X which cures problem X, but also creates problem Y, and we find ourselves running around in circles trying to make a system balance, when that is what Adam Smith taught us back in 1776 works very effectively with the so-called invisible hand. He was right back then and I think he would be right today.

Senator BAYH. You had mentioned that there had been some barriers heretofore to expanding our LNG importation capacity. I think you mentioned security concerns, environmental concerns. Could you expand upon that just a bit? What has been the historic reluctance to expand this capacity?

Dr. GREENSPAN. It is the "not in my back yard" syndrome. These are big facilities and these are not the types of things you want in your back yard. Indeed, what is happening as a consequence of that is there is a very significant effort in LNG technology to move the whole process of import offshore. There are technologies which are now developing in which you are getting LNG carriers which can regasify on the ship and connect 20, 30, 40, 50 miles out into a regular natural gas pipeline which could interconnect with our basic system.

So we may find that the newer technologies will be less LNG terminals that are fixed and a good deal more of this flexible technology which enables ships parked out over the horizon to regasify LNG into standard gas and just pipe it into the system. I think that that is likely to happen more and more, but if we just let the market determine where the capital is put I think we will be quite satisfied with how that comes out.

Senator BAYH. A combination of market forces and technological advances may be our best allies here.

I see my time has expired, Mr. Chairman. I just have one final comment. You testified that two-fifths of proven gas reserves are in Russia?

Dr. GREENSPAN. No, in the former Soviet——

Senator BAYH. The former Soviet Union.

Dr. GREENSPAN. It is about 30 percent in Russia itself.

Senator BAYH. It struck me that this has some obvious implications for the importance of that relationship going forward.

Dr. GREENSPAN. Yes, sir.

Senator BAYH. Thank you, Mr. Chairman.

The CHAIRMAN. Senator Landrieu.

Senator LANDRIEU. Thank you, Mr. Chairman.

Mr. Greenspan, thank you for your comments and for helping us focus attention on this very, very important issue.

The CHAIRMAN. Senator Landrieu, might you permit me to comment on a visit that I recently took to your State?

Senator LANDRIEU. Please, Mr. Chairman.

The CHAIRMAN. I think it has something to do with the testimony that the distinguished witness has had here regarding values.

Mr. Chairman, I was privileged to fly out on a helicopter about 5 miles out into the Gulf of Mexico and land in a helicopter on a bed out there, a great big configuration that looked much like, when you look at it from the inside, like the size of a nuclear powerplant. 156 people live there day and night.

There are ten wells down into the ocean bed that bring forth large quantities of oil and gas. They did not drill until they knew it was there using modern techniques. They were very proud to tell us that in all their efforts from the beginning to that date they had spilled into the waters of the Gulf three-quarters of a cup of oil. That was the extent of the environmental damage that they contributed to that particular water.

I recall, as do you better than I, the arguments against doing what is being done there, most of which were based upon non-objective arguments that had to do with spoilation and environmental degradation. The other most interesting thing was you could see from the place where you sat and watched, you could see that there were more fish of large sizes and, believe it or not, more fishing boats by large amounts out there near that platform than there were anywhere else around.

I merely cite that because this Senator has been a staunch advocate, obviously, of what you have spoken about today in the market, and I cite it because truly the issue on balance is not always just balance. One of the big issues is how do you try to make sure the American people get the facts, not the contentions of those from each side of the equation.

Senator Landrieu.

Senator LANDRIEU. Well, I thank the chair. It was a quite wonderful trip for us to be able to share the bounties of south Louisiana and the coast and for the chairman to fly out and land on a rig. He was lucky we got him out a day before the storm, but we made sure of that. The last thing I wanted to do as a rookie member of this committee was to lose a chairman out in the Gulf of Mexico. So we, Mr. Greenspan, ushered him out rather safely before the storm.

But seriously, I wanted to ask a few questions, but comment that Steven Brown, who is the Director of Energy Economics at the Dallas Federal Reserve Bank, stated recently that "Nine of the ten last recessions have been preceded by high energy prices." He went on to add that: "If high gas prices continue, the Nation's gross domestic production could fall anywhere between .6 percent to 2.1 percent short of where it would otherwise have been. Some estimate this could translate into a loss of between 770,000 jobs and 2.7 million jobs."

The reason I raise this and will ask you just to comment if those figures seem within reason is because a lot of these jobs are in Lou-

isiana. We are a huge, not only producer of natural gas, as the chairman has indicated, but we consume a lot of natural gas, which produces the fertilizer that grows the crops in the Senator from Montana's State, ammonia being the main component of fertilizer.

We had nine fertilizer chemical plants in Louisiana 3 years ago. We are now down to three. More than 3,500 employees; it is now down to 1,000. There are plants that the chairman has commented have come to his office indicating they are either closing, consolidating, or moving.

I want to say that, while this is an energy bill, I perceive it as a jobs bill. And while this is a hearing on natural gas, it really is a hearing on jobs in America. So would you comment, please, about this information from Mr. Brown? Do you agree or disagree? Do you think that is a reasonable estimation that we could lose millions of jobs more if we do not try to redirect some short and intermediate efforts to change this trend?

Dr. GREENSPAN. Well, Senator, I would have to see the actual calculations. My initial response is I am a little surprised at the size of the numbers he has gotten, largely because natural gas, unlike oil, is, as you know, about 83 percent domestically produced. When you get a rise in domestic prices for natural gas, it is not the same thing as if you were importing crude oil, which is essentially a tax. All of the difference goes to the producer of crude oil.

Here, the price rise is a transfer between a consumer and a producer, both in the United States. The general view is that the propensity to spend by the consumer is higher than that of the producer and therefore higher gas prices do in general lower the GDP. They certainly make considerable difficulties for households and for selected industries, and clearly ammonia and fertilizer are crucial industries and just as importantly in your State, Senator, the whole issue of petrochemical feedstocks and the petrochemical industry is involved.

So that there are significant economic effects. I would be a little surprised at the size of the numbers that my colleague came up with. But without looking at his assumptions and the details of his calculations, I really cannot make a judgment on the quality of the estimates.

Senator LANDRIEU. I appreciate your comments.

Let me ask you on a subject the chairman raised, which is the inventory, either proven or unproven inventory, of domestic reserves, proven or unproven domestic reserves in our country as well as on the continental, Outer Continental Shelf. When you comment about proven reserves in Russia, can you comment about the possibilities of there being more reserves in the United States than perhaps we have even estimated domestically because there are certain regulations currently that prevent us from actually inventorying what our complete assets are?

It is one of the things the chairman feels strongly about, getting an accurate inventory. Could you comment, in that you are advocating for more reasonable domestic production, which I tend to agree with?

Dr. GREENSPAN. Well, the notion of proved and unproved reserves is more of an art than a science, regrettably. There is no question that unless and until you drill a hole you are really not

certain you have got anything. Therefore, the inability to drill in areas where seismic and satellite technologies suggest the very high probability of oil or gas tends to make it difficult to judge whether or not you really have got those reserves.

I think it is everyone's general view that the so-called unproved reserves, the potential reserves in the United States that are economically potentially competitive, are really quite substantial. Unfortunately, we will not know that unless and until we go in and take a look.

Senator LANDRIEU. Finally, last question. We have been fairly, very generous actually, with tax credits for all sorts of items in the last several years here. Would it be of your mind that perhaps we could either look or relook at some potential tax credit or tax relief to give some relief to the users of natural gas, even as a temporary measure until our regulatory and policy issues can catch up with the extraordinary demand that is going to occur in this country? Some estimate a doubling or a tripling of the demand in the next 10 to 15 years.

Dr. GREENSPAN. Well, Senator, that is a judgment that the Congress has to make. You may recall when a similar situation arose with home heating oil the issue did create action on the part of the Congress. You have to be a little careful, however, to make sure if you do that you do not eliminate the normal rationing that occurs from higher prices in households. So that you have to be sure that what it is that one pays out in a government transfer payment is not tied to the price of gas directly, because if it is what you will find is that it could be counterproductive in a sense, because there is no question that when the price of natural gas goes up householders do cut back on consumption, as they should, and accordingly they assist the balancing of overall supply and demand.

So you do not want to abort that particular process by any form of subsidy. So I would merely suggest that if you do it make certain that it is not a function of how high the price is.

Senator LANDRIEU. Thank you.

The CHAIRMAN. Thank you very much, Senator.

Senator Bunning.

Senator BUNNING. Thank you, Mr. Chairman.

Thank you, Chairman Greenspan, for being here. I think we have a real conflict in the United States of America. We have—on the one hand we have a policy of the Federal Government over the past 15 years pushing and encouraging the use of natural gas to produce electricity, and on the other hand we have this supposed shortage or limited supply of natural gas, and therefore we have a direct conflict.

The conflict is between what we use to make electricity with and what we use for natural gas on the other hand. There are many other uses for natural gas. So that has been a big conflict and that is the reason we have spikes up to $9 and that is the reason we have a cost, Btu cost, of about $4.50 from a $2.25 just in the recent past.

Let me ask you the question, have you had a chance at all to read the new energy policy bill that we are about to take up at the end of this month?

Dr. GREENSPAN. Senator, I have glanced through it, but I cannot say that I am fully familiar with it in detail.

Senator BUNNING. Okay. We address many of these conflicts in this new energy bill that we are going to address on the last week in July. One is how we look at coal. One is how we look at natural gas. One is how we overall supply and where we can environmentally soundly produce from coal and from natural gas, the conflict that you talked about, where we can resolve part of that.

I believe unless we look at all alternative fuels and the use of what we have now in direct relationship to natural gas, we will never solve that problem that you talked about, whether it is pristine wilderness, whether it is wilderness that is, as some of our colleagues on this committee say, it is not pristine.

We have to have the ability somehow to produce domestically a larger supply of our own natural gas, and we have to also be able to use coal and other fuels to produce better results environmentally and economically for the market. I would agree 100 percent with you that the market should dictate the cost of these production and these fuels.

My question is, do you think the Government's shift to the use of natural gas in the production of electricity has had a dramatic effect on the cost of natural gas over the past few years?

Dr. GREENSPAN. It certainly has, Senator, and one need only look at the price of natural gas in other countries, which is significantly below where we are. And even though many of them have similar policies, they do not have it to the extent that we do relevant to our supply-demand balance. Had we not had this type of situation, there is no question that the domestic price of natural gas would be lower than it is today.

Senator BUNNING. I happen to agree with you 100 percent.

You have indicated you think that liquified natural gas coming into this country would be a big help or could help alleviate some of the problems we are having.

Dr. GREENSPAN. Senator, our experience with crude oil tells us that we do have the capability, when confronted with a production shortfall or a crisis, to bring in crude or products from any place in the world fairly quickly and prices never get out of hand. In fact, as I mentioned in my prepared remarks, the Venezuelan situation was one that could have been a real serious problem, and it was not.

But we have got a 62-year supply in the world of natural gas and only 43 years of supply in crude oil. So there is this vast amount of gas that is out there, which if it comes into this country at competitive prices will essentially solve the price problem or, I should say, the price volatility problem. It will not solve the security problem because clearly it will make it worse.

So I think we as a minimum ought to at least have a standby LNG system, even with the capital cost that that implies.

Senator BUNNING. The storage areas, you are talking about?

Dr. GREENSPAN. The storage areas, the capacity in an emergency to bring in either spot or short-term cargoes of natural gas—an ability to address any price problems which are strictly temporary imbalances of supply and demand. But recognize that longer term,

while we do have that backup, we should work to try to eliminate it as a backup in producing far more domestic supply.

Senator BUNNING. My last question. I know my time has run out. Liquefied natural gas can be brought to this country and, as you suggested, with the right facility and right storage facility, can be converted immediately into natural gas and therefore put right into the supply system. If we can do that in a reasonable and rational fashion over the next year or two—and I think we can do that; it is just a question of whether we want and have the will to do it—if we pass the bill that we have before the Congress at the end of this month, we will have solved an awful lot of these problems. And I hope that you take a little better look or you have a little more time to look at it.

Thank you.

Dr. GREENSPAN. I shall.

The CHAIRMAN. Thank you very much.

Senator Talent and then, Senator Craig, will you wrap this up. We are going to have votes. You close it down and I will be back and open the next session.

Senator TALENT. Thank you, Mr. Chairman.

Chairman Greenspan, I am grateful to you for spotlighting this issue. I think you have done a real effective job of doing that. I know you are here because, at bottom, because you are concerned about the impact of rising natural gas prices on the economy, on economic growth and our ability to recover from the recession. I mean, that is really what it comes down to, is it not?

Dr. GREENSPAN. Exactly.

Senator TALENT. Now, have you or has the Fed quantified that at all? I mean, are you able to give us any estimates about what this doubling in natural gas prices has done to GDP or unemployment or any of the other economic indicators?

Dr. GREENSPAN. We have looked at it to date. To date the damage is still quite minimal, with the obvious exclusion of the chemical industry, very specifically ammonia, fertilizer, and a number of petrochemical feedstock operations. We do not find at this particular stage that aggregate manufacturing production has been significantly affected, but we do find that the profit margins of non-energy, non-financial corporations have been squeezed, and clearly over the longer run that has got to have a negative effect overall. We have not yet had the impact which, if the market follows the futures market pattern into the winter, we are going to have with respect to households.

So as yet the effect has been containable. But if you project it out over the longer run it has clearly quite negative effects.

Senator TALENT. Okay. So what you are telling us is that maybe you cannot quantify it, give us a percentage of GDP, but there is no question that the economy has been hurt to some degree already by this and will be hurt more unless we do something; is that your testimony, then?

Dr. GREENSPAN. Yes, sir.

Senator TALENT. I wanted to get that right on the record.

Now, the only other line I wanted to explore, Mr. Chairman—I know we are short on time—is your statement about the value choices we have to make and the tradeoff between the pristine en-

vironment and economic—and a supply of energy and therefore economic growth in this case. I want to explore that a little bit, because I am wondering if this is not a case of what my old professor, Murray Weidenbaum, who I know you know very well, used to call a false conflict, one that looks like a conflict, but when you actually get into it isn't much of a conflict.

I mean, for example, you testified that economic growth not only does not hurt environmental health, but it helps. In other words, the more the economy grows the healthier the environment is just in terms of human health.

Dr. GREENSPAN. That is correct. I try to distinguish, however, Senator, between two different aspects of so-called environmentalism which I think are really quite distinct. One is the values that one achieves from viewing pristine wilderness. I do not know a human being who is not struck by some of those sights that we see in our West, for example. That is not the same thing as the issue of particulates in the atmosphere and unclean water or pollution, toxic chemicals, and a variety of other things. Those do clearly over the long run become a function of economic growth, not the more growth the more pollution, but the other way around.

In the short run it is correct that you rev up industry, as we did for example in Britain with the beginning of the Industrial Revolution, and there was just a huge amount of pollution in that environment. Yet the population was higher than it would otherwise have been. So it tells you that underneath the general growth of an economy are the mechanisms by which you tend to improve health, and, as I mentioned before, we do not recognize how critical clean water was in this country to creating a very significant increase between, say, 1900 and 1920, 1925, in life expectancy.

Senator TALENT. What I wonder and my final really inquiry is whether you have studied, the Fed has studied, the connection between economic growth for an economy at our level—you see, I think we are a mature first world economy, obviously—and the pristine aesthetic quality of the environment. Because you see, common sense tells me that it is the poorer countries around the world that not only have an environment that is less healthy, but also have an environment that is less pristine, precisely because in order to produce, they do not have the affluence, they do not have the technological innovations to do it in a way that protects the pristine quality of the environment.

I am wondering if at the stage we reached as an economy, whether continued economic growth at a robust quality is not essential to preserving the pristine quality of the environment. I will let you comment and then thank the chair for letting me.

Dr. GREENSPAN. I would agree with that and I would merely stipulate that if you go back to the United States in the 1890's you will find that you had very heavy effluents and very poor environment in the areas where factories were. We do not have that today, and I fully agree that the evidence does suggest that the higher the standard of living the—I do not know whether it is the pristine environment issue, because people tend to think of the pristine environment as one untouched by human activity. It is a very subtle, very tricky valuation issue, but it is something we have to at least

recognize and identify if there is going to be an appropriate judgment on the part of the Congress.

Senator TALENT. I agree. I just think when we do that we will find that about 90 percent of this conflict is what Professor Weidenbaum used to call a false conflict.

Dr. GREENSPAN. It may well be.

Senator TALENT. Thank you.

Dr. GREENSPAN. He has been right more often than not on such issues.

Senator TALENT. I thank you. And thank you, Mr. Chairman.

Senator CRAIG [presiding]. Senator, thank you.

We have been joined by our colleague from New York, Senator Schumer. Do you have a question of the chairman?

Senator SCHUMER. Thank you, Mr. Chairman. I again appreciate your erudition here.

The first question I would like to ask is this. There are—I know Senator Burns while I was out—we had another hearing—had touched on this, but I wanted to ask a little further. There are certain industries that are very dependent on natural gas, the chemical industry for instance. And with the high costs of natural gas right now, even if we were to alleviate them 5 years from now, from what I understand large parts of the chemical business will go offshore, never to return, because it is a capital-intensive business.

What can we do about that? Would you think that a certain set-aside of natural gas at a certain price for that industry would be worthwhile? I understand that is non-economic, but having this industry leave and come back—you know, we do have externalities. We do have transaction costs that make certain non-economic things worthwhile.

Could you talk about that for a little bit, because it is something I worry about.

Dr. GREENSPAN. Yes, and it is something if you do it I worry about, and I will tell you why. I have observed these types of solutions year after year and they seem to work for one industry and then you find that you are creating more problems for other industries. I am not certain if you put aside say some LNG storage selected strictly for the chemical industry that that would make all that much difference, because they are thinking longer term and unless they knew that there was a long-term solution here which brought the price of natural gas down to world competitive levels, the mere existence of a short-term fix is not going to keep them here.

Senator SCHUMER. Well, let me modify the question. If we were to come up with a long-term solution, would this short-term solution also be a worthwhile thing to pursue?

Dr. GREENSPAN. I frankly doubt it, but——

Senator SCHUMER. I did not think you would change your mind.

Dr. GREENSPAN. I am open to evidence on that question.

Senator SCHUMER. From what I am told, for instance, it is a very small percentage of total natural gas use that has huge effects on an industry, a capital-intensive industry that cannot go back and forth very much. So I think you need both. I could not agree with

you more, no one is going to—no one is going to be able to stay here if there is not a long-term solution.

But if it were half of one percent of total domestic natural gas production and created a huge multiplier effect of things staying here, it is something I think worth considering.

Dr. GREENSPAN. Senator, I would suggest that if your long-term solution was credible that you do not need the short-term solution.

Senator SCHUMER. We will see if we can come up with a long-term solution.

Next question I have is about conservation. We have talked mostly in this committee about new production, as have you, and I have not been averse to new production. I am not an ideologue on these things. I think we need some of each. But I do think that probably if you gave a—if you did a bird's eye view of our immediate problem, that some forms of conservation and efficiency might help alleviate the problem as quickly and as economically efficiently as new production.

Do you disagree with that?

Dr. GREENSPAN. No. If demand exceeds supply, you bring the gap down either by increasing supply or by decreasing demand.

Senator SCHUMER. And do you have any adverse—I mean, you may, knowing you as much as I do and respect—knowing you as well as I do and respecting you as much as I do. But certain governmental measures to increase that efficiency, would you necessarily rule those out, or would you just wait for the market to produce them?

Dr. GREENSPAN. No, I think most of the action that probably would be helpful in this area is unwinding previous government regulations. But I do not deny that certain standards which you can set up could actually be effective in that regard.

Senator SCHUMER. Glad to hear that.

The next question is a little bit about the Rocky Mountain gas area, where I am open to looking at it. I was one of the Democrats who voted to explore in the east coast, in the east Gulf, much to the chagrin of my Florida colleagues. But I asked the environmentalists what was the problem with oil in the west Gulf, give me the environmental problems? There were virtually none. So I said, well, then we should be open—you know, we had a vote on opening some tract or other.

Senator LANDRIEU. You did a great job.

Senator SCHUMER. Yes, you would know better than me.

Well, the same thing, the same thing with the Rocky Mountains. There are some areas that we would not want to see touched. They are beautiful, they are pristine areas, national parks, national monuments. Then there are some areas which already are open to complete exploration.

The rub occurs in the level two areas, where there are some restrictions right now, but not prohibitions. What would be your view of this? Here is the basic argument. The people—some people come in to me and say: The best thing we can do, we do not need to change those level two areas; it is the level three areas where you have production; you can make it more efficient and that can happen on its own and that can most increase the production of natural gas, which we all agree we need.

I mean, I just have to tell you, New York State—is my time up? I am sorry, Mr. Chairman.

The CHAIRMAN [presiding]. It is.

Senator SCHUMER. I apologize.

Do you think there is a greater chance of looking at existing places in the Rockies and just increasing the efficiency there or changing the regulations, removing some of the regulations, and going into the level two areas, just in terms, not making the environmental way—that is our job, as you say—but in terms of bringing more gas quickly to the fore?

Dr. GREENSPAN. I think that if you took a look at level two and you made the whole structure of regulation much easier and not as prolonged, you would bring down the risk premiums involved in new investment in those areas, which probably would create more than anything else you can do. I merely say that because, looking at the various different requirements that are involved to get permits, the risk premiums with the uncertainties and the arbitrariness of some of the things that go on—the elimination of that has got more possibilities of getting effective production.

Senator SCHUMER. Thank you, Mr. Chairman and Mr. Chairman.

The CHAIRMAN. Thank you very much, and I was very pleased to hear your comments, Senator. I did not mean—I rattled by mistake. I was not trying to stop you.

Senator SCHUMER. You were applauding me, one of the rare moments.

The CHAIRMAN. That is exactly it.

Thank you so much.

Senator SCHUMER. I am finished.

The CHAIRMAN. And he happens to be right, without being from out in the West, too. The problem is not the wilderness with a capital "W"; the problem is how long it is taking for the non-wilderness areas. It is equivalent to being closed because it takes so long. Those people who take risks equate that with being closed and therefore give up. That is what he is referring to.

Senator Craig.

Senator CRAIG. Thank you, Mr. Chairman.

Let me comment to my colleague from New York, Senator Schumer. About 5 or 6 years ago I was out on the Rocky Mountain Front looking at potential production sites and looking at rehabilitated exploratory sites. I think Chairman Greenspan would appreciate this. We were landing in a helicopter and as we dropped into this mountain valley Jackson Hole, Wyoming, which is one of the favorite recreational spots in the western world today, disappeared from the skyline as we settled into this valley to look at a well drilling site.

We could not find this rehabilitated site. It was not visible, the grass was so robust, the reclamation had been so thorough. And as we landed where they thought it had been, an elk cow and her calf jumped up out of the grass and took off. She was resting on the old drilling site, and the reason she was was because the rehabilitation had been so effective that there was better grazing there for her and her calf. And we were in eyeshot of Jackson Hole, Wyoming.

That just tells you what can happen when we do it right. But what is the conflict and what we try to address in our new legislation is allowing them to get to that site to drill in the first place. Once they get there, and if production is found, fine; if not, they rehabilitate it and move on. There lies our greater conflict.

Mr. Chairman, over the 4th of July I was in north Idaho and in north Idaho a marvelous new gas-fired electric turbine, electrical generating turbine, had been in operation for about 2 years, straddled one of Williams' pipelines coming down out of Canada. That turbine is now off, shut off; the price of gas too high. And yet that was, of course, the answer to the energy crisis that had bled up into the Pacific Northwest out of California a couple of years ago. So the marketplace is working, obviously. That price—that facility came off line some months ago.

My question or my thoughts for you to respond to are in that nature, because according to several energy industry analysts the focus on natural gas as a way to achieve environmental improvements without increasing power generating costs has had an unfortunate and a likely unforeseen and unintended consequence of reducing the resilience of the natural gas market. That is now what you have spoken to, the inability to have elasticity in it.

The analysts go on to say regulatory mandates have constrained us away from being able to apply the lessons of portfolio diversification to our energy choices and our inability to diversify our fuel input portfolios makes for markets that do not adapt to unanticipated and changing conditions—less flexibility.

I would appreciate hearing your thoughts and your conclusions as it relates to your views on how Congress might compound—might avoid, if you will, compounding the exacerbating, costly balkanization of our fuel portfolio, because that is really what has happened, it appears, at this moment. That is what we are trying to address in the bill. You have spoken to the fact that you have not looked at it in detail per se, but additional thoughts you might have that bring us back to that kind of flexible portfolio.

Dr. GREENSPAN. My own impression, Senator, is that we have a lack of appreciation of how important competition is in the area of energy, as it is everywhere else. It is important, however, to recognize that, unlike other areas of industry which produce tangible goods, we have got two major aspects of our energy system in which the output is either wholly ephemeral or close to that in electric power and in natural gas, which means that the normal competitive mechanisms which largely work through inventories have to be looked at differently.

In other words, if you are dealing with an electric power system what you really ultimately try to do is, before you build a plant, is to lock in a series of contracts which effectively over the lifetime of the plant creates adequate revenues so that the cost of capital is met or exceeded. Unlike something in which you can inventory anything, you need something which gives you long-term contracts, and long-term contracts are one of the very few ways you can get around a system where no inventories are possible.

Similarly, we have something close to that in natural gas. We for example even in LNG do not have pure spot markets. What we have is short-term markets where there is a period over which

LNG will be brought in, but the substantial part of LNG, at least in its original form, was long-term contracts. In effect, you built the liquefaction plant and you built the shipping and you financed it essentially by long-term contracts, as indeed an office building builder would do in making sure he got long-term leases.

So I think it is in that context of trying to understand where competition is most effectively placed that I think most of the improvement can be made in this country with respect to our energy structure.

Senator CRAIG. Mr. Chairman, thank you very much.

Thank you, Mr. Chairman.

The CHAIRMAN. We are going to call our next witnesses even though we are suffering under the possibility of a vote, in which event we will just take turns. I would rather get them finished than make them wait and come back after lunch. We will just have more scheduling problems.

Having said that, Dr. Greenspan, thank you once again for your help. I consider it not testimony, but help. We are going to try to do something for our country with reference to a policy. You will not like it in every respect because there are some things we are going to try to promote, and sometimes our way of promoting things is a little different than pure, at least pure as you so adequately state, which your word for pure is "competition," I would assume, and we cannot do that in every respect.

As a matter of fact, we have concluded that something happened to nuclear power that is not just a market issue and as a consequence I have convinced this committee and the Senate that we should do something a little bit different and see if we cannot get a couple of them built. I am not sure I could ever sell you on that, but it would be a very interesting subject matter for discussion.

When you look at that chart, not only do you see where we were when we had coal and nuclear powerplants and when we had natural gas—of course, natural gas there is in such small quantities in the earlier years, because you and I both remember we had made a terrible mistake and regulated natural gas.

When I first started working on it it was regulated at 7 cents. You might recall those days. Seven cents was the regulatory price. As a consequence, we were told we had none, we had no natural gas. You are now telling us that if you look at the world it is probably, of the great energy sources, probably the most abundant and most available worldwide of all of them, and we were told there were none.

Now here we are, we have just about abandoned everything for one reason or another, and this bill is going to make an effort to say in 10 years the line should not be quite such a totally red spike; it should have some other things in it. We hope we can succeed as well as you have put the problem to us with some solutions.

With that, we thank you again and we excuse you and call our next panel. Thank you, Dr. Greenspan.

Dr. GREENSPAN. Thank you very much, Mr. Chairman.

The CHAIRMAN. Thank you.

The next panel, please: Honorable David Garman, Assistant Secretary of Energy Efficiency and Renewable Energy from the De-

partment. Would you please take your seat. Richard Grant, president and CEO of Tractebel LNG North America of Boston; Brian Ferguson, chairman and CEO of Eastman Chemical, Kingsport, Tennessee; and Bruce Thompson, executive director of Industry and Public Affairs for Forest Oil of Denver.

I think what we will do, fellow Senators, is just start as they were called up, with David Garman first.

Would you please just understand now, the statements, if you have them prepared, they are part of the record as of now. You do not have to ask that and that is done. Would you please limit your remarks to about 5 minutes and then we will try to question you thereafter.

We will start with you, please. We will state it again: You are the U.S. Government's manager of our energy efficiency and renewable energy in the Department. And it is interesting to note, I believe, that if you look at that last line there, that little yellow on the top, while that is not all within your portfolio, that is beginning to show the effects of renewables on that, on the top end of that, beginning to show some significance.

Please proceed.

STATEMENT OF DAVID K. GARMAN, ASSISTANT SECRETARY, ENERGY EFFICIENCY AND RENEWABLE ENERGY, DEPARTMENT OF ENERGY

Mr. GARMAN. Thank you and thanks for the opportunity to appear today. As the committee well knows, current stocks of natural gas in storage are at unusually low levels due to a combination of cold winters in the Northeast and Mid-Atlantic regions this past winter and declines in both domestic production and net imports. As a consequence, gas in storage as of July 4th was 15 percent below the previous 5-year average.

Average wellhead prices for natural gas this year are now expected to average $2 per thousand cubic feet higher than last year, a 68 percent increase. If we are to get 3 trillion cubic feet or more into working storage by the start of the winter heating season, we need to inject an average of roughly 75 billion cubic feet each week between now and November. In normal years we have injected an average of 53 billion cubic feet per week during the weeks remaining in the refill season. So it is encouraging that this year's weekly reinjection rate has averaged about 84 billion cubic feet per week. Today's number, which was just announced at 10:30 this morning, is that in the week ending July 4th we were able to store 111 billion cubic feet, which is very encouraging.

But we cannot take too much comfort in these numbers as we are mindful that the highest electricity demand of the summer is likely ahead of us and that some of our capability to place this much gas in storage may be coming as a consequence of demand disruption among industrial gas users, and that is not the way we want to address the problem.

Unfortunately, no single course of action will address this challenge either in the long term or the short term and no single entity or group—the Congress, the administration, industry or consumers—can meet this challenge working alone.

Back in the spring of 2002 Secretary Abraham requested the National Petroleum Council to conduct a comprehensive study of natural gas in North America, including supply, demand, and infrastructure issues through 2025. The results of this study will be delivered in September of this year and we believe it will be helpful as we work toward long-term solutions.

But we also need to act in the short term. On June 26, Secretary Abraham and the National Petroleum Council hosted a natural gas summit in Washington, D.C., to identify those actions that can be taken immediately to address short-term supply constraints. The summit brought together a variety of representatives from consumer groups, industry, State and local governments, along with experts in energy efficiency and conservation.

One of the suggestions coming out of the summit was to undertake an immediate public awareness campaign to promote energy efficiency and conservation as one of the primary short-term tools available in meeting the gas supply challenge. Yesterday Secretary Abraham launched our "Energy Smart" public awareness campaign designed to inform consumers of the steps they can take now to save money, save energy, and help alleviate energy price and supply issues before they become more acute.

This is a multifaceted campaign and has many elements. Our new EnergySavers web site is now up and running at www.energysavers.gov. We are increasing our efforts with retailers and other Energy Star partners to promote energy efficient products. We are collaborating with public and investor-owned utilities on bill inserts, public service announcements, and other methods to reach consumers. We are working with States on ways we can speed and improve communications with Governors and State energy offices and leverage existing State energy emergency plans in light of the current situation, and we are doing many other things as well.

Yesterday, the Secretary and I were in New York in support of this campaign. Today, the Secretary is in Philadelphia, Columbus, Ohio, and Milwaukee. Next week we expect to be in Atlanta. And we will continue this campaign with a series of regional summits and events across the Nation in the weeks ahead.

Since the Federal Government is the largest single user of energy in the Nation, with 500,000 buildings that consume electricity or natural gas or both, we believe we have a continuing responsibility to lead by example. On June 12, the Office of Management and Budget directed the Federal agencies to redouble their efforts to reduce energy consumption in light of the current natural gas situation. Additional efforts are under way.

Promoting energy efficiency as a foundation for action in the near and long term is important, but it is not enough. Congress should complete action on comprehensive energy legislation that is mindful of supply as well as demand. Congress should pass the President's Clear Skies Act. This legislation will provide some badly needed regulatory certainty for coal-fired generators while lowering emissions of SO_X, NO_X, and mercury by 70 percent from today's levels with greater speed and at a lower cost to consumers than existing law.

We must encourage liquefied natural gas supplies in the future. On Tuesday Secretary Abraham announced that he would bring together energy ministers and industry officials in an LNG summit in the United States later this year.

We must encourage responsible—environmentally responsible—domestic production in Alaska, the Outer Continental Shelf, and on our public lands whenever it can be balanced with responsible environmental protections.

We must maintain a diversity of supply by maintaining nuclear power and continuing the development of our renewable energy resources, including hydropower, wind, solar, and biomass. In those regards and many others, we appreciate the leadership, support, and encouragement that the members of this committee have provided in the past and we look forward to working with you as we move ahead to address this challenge.

With that, I will be happy to answer any questions you may have either now or in the future.

Thank you, Mr. Chairman.

[The prepared statement of Mr. Garman follows:]

PREPARED STATEMENT OF DAVID K. GARMAN, ASSISTANT SECRETARY, ENERGY EFFICIENCY AND RENEWABLE ENERGY, DEPARTMENT OF ENERGY

Mr. Chairman and Members of the Committee, I appreciate the opportunity to appear today to discuss the Department of Energy programs for energy efficiency and renewable energy and how our technologies will make a difference in conserving electricity and natural gas.

Our current stocks of natural gas in underground storage are unusually low due to a combination of cold weather in the Northeast and Mid-Atlantic regions this past winter, and declines in both domestic production and net imports. As of June 27, gas in storage was 17 percent below the previous five-year average, although there was a record storage build for the month of June. Nevertheless, a hot summer could increase natural gas demand, causing price volatility and hampering economic growth. Wellhead prices for natural gas in 2003 are now projected to average $2 per thousand cubic feet higher than in 2002, a 68 percent increase.

PROMOTING ENERGY EFFICIENCY AND CONSERVATION

A balanced energy policy must address issues of supply and demand. More than half the 105 recommendations in the President's National Energy Policy (NEP) address efforts to improve our energy efficiency and to improve the performance and lower the cost of alternative forms of energy.

The NEP also included a variety of recommendations for increasing the availability and affordability of our Nation's natural gas supplies. These include:

- enacting comprehensive energy legislation;
- expediting the building of an Alaska natural gas pipeline;
- examining the potential for greater electricity generation from sources other than natural gas;
- streamlining the permitting of energy infrastructure;
- increasing energy conservation and efficiency;
- providing funding for advanced technologies.

One of the specific recommendations in the NEP is to improve the energy efficiency of appliances by supporting the appliance standards program, and setting higher standards where technologically feasible and economically justified. Moreover, the NEP recommends an expansion of the program to new appliances when technologically and economically justified.

In keeping with this recommendation, the Department has identified residential furnaces and boilers as one of its "high" priority energy efficiency standards and is currently drafting the rulemaking. Such a rulemaking has the potential to save both electricity and natural gas. In addition, the Department has identified as "high priority rulemakings" the efficiency standards for distribution transformers, and commercial air conditioners and heat pumps and is currently drafting these rulemakings. Furthermore, the Department plans to add to the program new cov-

ered products such as torchieres, ceiling fans and commercial refrigeration equipment.

As important as they are for driving market transformation to more efficient appliances over the long term, new appliance standards cannot be brought to bear in time to address our near term challenge.

NEAR-TERM ACTIONS

Completing the National Petroleum Council (NPC) Natural Gas Study

In the spring of 2002, Secretary of Energy Spencer Abraham requested that the NPC conduct a comprehensive study of natural gas in North America, including supply, demand, and infrastructure issues through 2025. The results of this study will be delivered in September of this year.

The study will examine new supplies, new technologies, and new perceptions of risk that may affect supplies and consumption in the mid and long-term. It will provide insights on market dynamics, including price volatility and future fuel choice, and sustainability of natural gas supplies. The study will provide the most comprehensive analysis available of the issues affecting natural gas supply, demand, and transmission and distribution through 2025. Then NPC has collaborated with the Canadian and Mexican governments to ensure that the whole North American natural gas picture is considered.

Natural Gas Summit

Secretary Abraham also called on the NPC to host a Natural Gas Summit on June 26, 2003, in Washington, D.C. to discuss problems and solutions, and identify those actions that can be taken immediately to ease short-term supply constraints. The Natural Gas Summit brought together representatives from consumer groups, industry, environmental groups and federal, state and local governments, along with experts in energy efficiency and conservation, all of whom offered their ideas on these issues. At the Summit, Secretary Abraham announced a Natural Gas Data Initiative and a series of regional conferences.

There was a consensus among the participants that promoting public awareness of the natural gas supply situation and promoting energy efficiency and conservation are the primary short-term tools available to us.

Secretary Abraham Unveils "Energy Smart" Public Awareness Campaign

Yesterday, Secretary Abraham launched our "Energy Smart" public awareness campaign designed to inform consumers of the steps they can take today to save money, save energy, and help alleviate energy price and supply issues before they become more acute. Our new "Energy Savers" website is up and running at www.energysavers.gov; we are collaborating with public and investor-owned utilities on bill inserts, public service announcements and other methods to reach consumers; and the Secretary is on the road today in Philadelphia and Columbus in support of this public awareness campaign. We expect to continue this campaign with a series of regional summits and events across the nation in the weeks ahead.

Working With States

We also recognize the importance of working with States to promote energy efficiency and renewable energy technologies in the short term. The Department's State Energy Program (SEP) provides funding to states to design and carry out their own energy efficiency and renewable energy programs, and we are exploring new ways we can speed and improve communications with Governors and State Energy Offices, and leverage existing State energy emergency plans in light of the current situation.

Leading by Example

The Federal Government, the largest single user of energy in the nation, has 500,000 buildings that consume electricity, natural gas, or both. Thus, we have an obligation to lead by example.

As a consequence of the energy savings targets in both statute and executive order, the Federal Government is on target to reduce its energy use 30 percent by 2005 compared with a 1985 baseline. We have already achieved a 23 percent improvement overall, and many agencies such as the Department of Energy has done even better. On June 12, 2003, OMB directed the federal agencies to redouble efforts to reduce energy consumption in light of the current natural gas situation. Additional efforts are under consideration.

Leveraging the Power of Consumer Action and Choice

Collectively, the nation has a tremendous capacity to use energy more efficiently, although it is a challenge to get consumers to act prior to feeling the full brunt of a price spike. There are things that we can all do in our homes to help conserve natural gas and save on our utility bills:

- Check the insulation in your attic and basement. We've found that only 20 percent of the homes built before 1980 had adequate insulation.
- Consider investing in a programmable thermostat. You can save as much as 10 percent a year on your heating and cooling bills by simply turning your thermostat back 10 to 15 percent for 8 hours.
- Replace your home lighting using compact florescent lamps (CFLs). The lamps are much more efficient than regular light bulbs and last 6 to 10 times longer. If every household in the United States replaced one incandescent light bulb with an ENERGY STAR qualifying compact fluorescent light bulb, the energy saved would be enough to avoid the need for more than 16 new power plants.
- If you're ready to replace an appliance, look for one that has the ENERGY STAR label. This identifies the appliance as among the most energy-efficient on the market.
- Maintain your existing appliances properly, including changing the filter frequently in your heating, ventilation and air conditioning systems.

Mr. Chairman, while these ideas may seem intuitive, we've found that implementing these simple tips does make a difference in consumer energy bills, and can make a difference in overall energy demand, including natural gas and electricity—some of which is generated using natural gas.

Secretary Abraham recently provided these tips, and other energy saving ideas, to all Members of Congress, and we urge you to do everything in your power to share these energy saving tips with your constituents. You are welcome and encouraged to provide links to the "energysavers.gov" website through your own Senate websites.

MID- TO LONG-TERM SOLUTIONS: EERE PROGRAMS

Pursuing greater energy efficiency is not simply a short-term undertaking. Many of the programs in our office are developing technologies to reduce energy usage in the mid- to long-term.

For example, our Industrial Technologies Program works in partnership with energy-intensive U.S. industries to increase their energy efficiency both now and in the future. While the Program addresses all industrial energy use, natural gas accounts for about one-third (7.5 quadrillion Btu annually) of all energy used by American industry.

Over the past decade, DOE and industry have co-funded the development of many energy efficient gas-based technologies that are already making an impact on natural gas conservation. Here are some examples:

- The High-Luminosity Burner replaces air with oxygen to increase the efficiency of gas use and boost production rates in glass-melting furnaces.
- The Forced Internal Recirculation Burner operates at high efficiency throughout its firing range in various boiler systems, while also reducing NO_X emissions to less than 10 parts per million.
- Methane de-NO_X technology injects small amounts of natural gas into coal- and biomass-fired boilers to increase efficiency and reduce emissions. This allows boiler operators to meet environmental regulations cost-effectively while continuing to burn biomass and coal rather than straight natural gas.

The Department and its industry partners are continuing to develop several other high-efficiency natural gas technologies that can further stabilize gas demand. We have recently announced a joint project with the glass industry and the gas industry to develop a Next-Generation Glass Melter, which could save as much as 25 to 30 Bcf of natural gas per year. The following three ongoing natural gas-based technology developments could collectively save more than 500 Bcf of gas per year when fully deployed (which is equivalent to about 10 days of U.S. gas consumption):

- The Super Boiler, designed to produce steam at 10 percent higher efficiency in thousands of industrial and commercial applications.
- Oscillating Combustion technology, to increase energy efficiency in a wide range of industrial gas furnaces while also reducing 50 percent NO_X emissions.
- A Self-Optimizing Combustion System for metal melting and processing that precisely delivers heat where needed while also minimizing metal oxidation losses during the energy-intensive production process.

Overall energy use may account for 10 percent or more of an industry's total operating costs. Our plant-wide energy assessments activity works with industrial facilities to investigate their energy use and highlight opportunities for best energy management practices including the adoption of new, efficient technologies. For example, a plant assessment at a metal heat-treating facility in Pennsylvania reduced natural gas use by over 50 billion Btu annually.

Industry is very price sensitive and deploys the technologies developed under these DOE-Industry R&D partnerships as they become available and conditions are favorable. Increasingly, DOE is now encouraging industry to undertake such near- to mid-term R&D itself while reserving DOE's funds for longer term research partnerships in breakthrough technologies. These have the potential to dramatically reduce energy use, including direct natural gas consumption and electricity generated by natural gas, in the longer term.

Electric power generation is becoming increasingly dependent on natural gas, as gas combustion turbines are comparatively inexpensive to install and can begin operating quickly. An electric power sector heavily reliant on natural gas for combustion engines could lead to higher electricity prices for industry and consumers if natural gas prices increase substantially.

As industry deploys the renewable energy technologies developed in partnership with EERE, the demand for electricity generated by fossil fuels, including natural gas, will be offset. New renewables, such as wind energy, biopower, solar energy, and geothermal energy, are all currently making contributions to U.S. electricity supplies and have the potential to dramatically increase their role. Wind energy has been the fastest growing source of electricity in the United States in recent years with 2100 MW added in the past two years, nearly doubling the total U.S. installed wind capacity to about 4700 MW.

Traditionally, natural gas has been the clean fossil fuel used for mid-range and peak electric power generation, as well as for space and water heating, and process heating at the building or industrial site.

EERE's Combined Heat and Power (CHP) research and development program helps provide highly-efficient on-site power generation and thermal energy, such as for steam or hot water, at the same time.

- The CHP systems recycle the waste heat from the electricity generation process that is normally vented to the atmosphere and instead productively use it for drying, heating, cooling (through absorption technology), and humidity control, effectively raising the fuel use efficiency from 25 - 50 percent, to 60 - 88 percent.
- CHP systems on customer premises also save the energy that otherwise would be lost in transmission lines.

In contrast to traditional generators, which produce electricity only and do not recapture waste heat, increased deployment of CHP systems could reduce natural gas consumption compared to providing electricity from a central station natural gas turbine and separate on-site use of natural gas for thermal energy. We believe that combined heat and power systems are one solution that can help mitigate the effects of natural gas price and supply problems on the electric industry and consumers as the nation's economy grows and the demand for electricity, particularly from natural gas, increases.

FEDERAL PROMOTION OF COMBINED HEAT AND POWER

The Federal government has the potential to be a significant end-user of CHP systems—more than 1500 megawatts of potential capacity. CHP offers flexibility in power systems and can help meet Federal energy-efficiency and emissions-reduction goals. It also lays the foundation for the integration of sustainable fuels and future technologies, such as fuel cells. And, as natural gas prices rise, CHP economics improve. The Federal Energy Management Program is working with Federal facility managers and industry, trade associations, energy service companies, and utilities to address regulatory and policy barriers to CHP deployment in Federal facilities.

One example of CHP systems is right here in our own back yard. Last year, the General Services Administration installed a CHP system at its Central Heating and Refrigerating Plant in Washington, DC, which serves several buildings, including the Department of Agriculture, the Department of Energy, and the Smithsonian Institute museums. The system provides 10 megawatts of electricity and 17,000 tons of refrigeration.

CONCLUSION

Mr. Chairman, as we move forward to increase energy efficiency and the use of renewable energy to conserve our natural gas resources, it is important to realize

that the Federal government can only do this in partnership with other public and private organizations. States and regional governing bodies play a critical role in eliminating barriers to and developing markets for these advanced energy technologies. Industrial and commercial users, equipment manufacturers, energy service providers, and National Laboratories need to work together and with all levels of government to achieve performance targets, develop reliable and high-quality systems, and integrate them into our existing energy infrastructure.

We at the Department look forward to continuing to work with the Congress to promote energy efficiency in the short and long term. We also look forward to working with the Congress in passing energy legislation that includes provisions ensuring our Nation a plentiful supply while promoting the efficient use of natural gas.

This completes my prepared statement. I would be happy to answer any questions you may have, either now or in the future.

The CHAIRMAN. Thank you very much. Thank you very much.

The president and CEO of Tractebel LNG North America. Nice to have you with us, Mr. Grant.

STATEMENT OF RICHARD L. GRANT, PRESIDENT AND CEO, TRACTEBEL LNG NORTH AMERICA LLC

Mr. GRANT. Thank you, Mr. Chairman and members of the committee, for inviting me to present testimony regarding LNG's role in the energy marketplace. I want to start off by noting two features of the current energy market. I think this has been referred to by a number of people. First, in the natural gas industry, supply growth is tightening; and second, demand growth continues essentially unabated.

As a result, many are concluding that LNG will be one of the long-term features of energy markets. Why are people looking carefully at LNG? I think the advantages are clear, but let me take a moment to note some of the most important ones.

LNG helps us access ample supplies of natural gas around the world. I think that has been referred to many times today. Estimates of the total world supply of natural gas hover around 6 quadrillion cubic feet. Much of this is stranded a long way from the U.S. market. Liquefying natural gas and shipping it is more economical than transporting it by pipelines for distances of more than about 700 miles offshore and 2,200 miles onshore.

LNG can contribute substantially to a region's energy supply. Our Everett, Massachusetts, terminal meets 15 to 20 percent of New England's natural gas demand, with LNG through other facilities throughout the region meeting 35 to 40 percent of the region's demand on peak days. In addition, we are supplying the fuel for a new 1,550 megawatt powerplant which is adjacent to our facility, which can generate enough electricity for approximately 1.5 million homes per year. If LNG resources were not available in New England, supplies would be far tighter and consumers would suffer.

LNG's technology is improving. The overall cost of LNG delivery has been reduced by almost 30 percent over the last 20 years.

LNG also keeps downward pressure on prices by helping to diversify a region's energy supply, again something that has been mentioned a number of times today. By competing openly and fairly with gas delivered via pipeline, LNG helps ensure that consumers get the best possible deal.

The industry receives and desires no preferential tax or regulatory treatment relative to other competitors in the natural gas industry.

LNG is a very flexible energy source. LNG import facilities can be upgraded quickly and substantially to meet increases in demand and, more importantly, once in operation can increase or decrease their output very rapidly.

LNG is as safe, if not safer, to transport and store than most other fuels. It is not explosive, it does not pollute land or water resources, it is not transported or stored under pressure. Further, even when LNG revaporizes as natural gas it is not as flammable as other common fuels, such as gasoline.

I would like to make three important points before I conclude: First, LNG needs to be thought of as complementary to our current resource base rather than a substitute for it. LNG should be considered an and, not an or, proposition to our other North American natural gas supplies in helping to meet our Nation's energy needs. Policymakers cannot and should not allow our very sensible and successful approach to LNG to obscure the fundamental reality that we as a country need to better access and develop our Nation's natural resource base.

Second, LNG will continue to grow as a resource for the United States. In our ongoing effort to diversify our supply of energy, LNG's exceptional and exclusive ability to bring to market what was once stranded natural gas from various sources around the world can only help. In short, increased global access to energy reserves helps us reduce our dependence on any one source.

Third, LNG can and must be an important participant in long-term markets. Our company both buys and sells much of its LNG under long-term contracts. Doing so helps provide certainty. An earlier comment about a safety valve and using LNG facilities there, the one caveat or the one thing that I would add to that is that I think that you do not want investments that basically have no returns on them. A stranded investment waiting there, which is what happened in the LNG business for a number of years, does not create investment opportunities or bring investors in.

But you could have it both, because in effect you could have base-load LNG coming in and the ability to ramp up on a daily basis, an annual basis, to meet increased energy needs can happen very quickly, and in fact that is what is happening in the United States today.

Again, Mr. Chairman, thank you and the members of the committee for inviting me to present our thoughts. I look forward to answering any questions you might have and working with the committee on these very important issues.

[The prepared statement of Mr. Grant follows:]

PREPARED STATEMENT OF RICHARD L. GRANT, PRESIDENT AND CEO, TRACTEBEL LNG NORTH AMERICA LLC

Thank you, Mr. Chairman and members of the Committee for inviting me to present testimony regarding possible approaches to help moderate natural gas prices and, more specifically, the role of liquefied natural gas (LNG) in the larger marketplace.

Before discussing LNG's place in the market today—and I'd like to emphasize that I view LNG as an important energy source in addition to other North American natural gas supplies, not a substitute for them—I think it might be helpful to put into the record important facts about the technology and fuel itself. These include:

- LNG is the same natural gas used by millions of Americans for heating and cooking, only in a different form.

- LNG is natural gas that has been cooled to –260 degrees Fahrenheit, at which point it condenses into a liquid. Liquefaction reduces the volume of the gas by approximately 600 times.
- Liquefaction of natural gas provides us with enormous flexibility because it allows us to store and transport the resource—the energy residing in the natural gas—to places that are not or cannot be fully served by natural gas pipelines.
- Liquefaction allows natural gas to be transported and stored efficiently and economically. It can be re-vaporized and sent to customers via pipeline or remain in liquid form for transport by truck to customers with their own storage tanks.
- Currently there are 113 active LNG facilities in the U.S., including marine terminals, storage facilities, and operations involved in niche markets. Worldwide there are 17 LNG export terminals, 40 LNG import terminals and 136 specially-designed LNG ships.

THE MARKETPLACE

I think it might be helpful to examine some of the history of the technology and the fuel, as well as some of the history of the marketplace in general.

During the oil embargoes of the 1970s, entire countries (including the United States), as well as regions within the United States (including New England), discovered the wisdom of diversifying fuel sources. At the same time, gas-rich countries without the need for additional energy resources began thinking about ways to leverage stranded gas reserves. For example, today LNG development is especially important for countries like Trinidad, Angola, and Nigeria. In these countries, most of the natural gas that is produced with crude oil is flared because there are few alternatives for usage or disposal of the excess gas.

Four marine LNG import terminals were built in the United States between 1971 and 1982. They are in Everett, Massachusetts, Cove Point, Maryland, Elba Island, Georgia, and Lake Charles, Louisiana. After reaching a peak in 1979 (253 Bcf), LNG imports declined over time for a variety of reasons. By 1995 imports had dropped to 18 Bcf. However, LNG imports are now on an upswing, with about 240 Bcf imported in 2001. Import operations are now poised to achieve new peak levels through the re-activation and expansion of the existing facilities. Within this year, Cove Point will re-open its LNG import operation. In 2001, the Elba Island import facility was reactivated. All existing import facilities are undertaking expansions. Beyond the activities of existing facilities, several new LNG projects are now pending before the Federal Energy Regulatory Commission, and there are numerous other LNG projects proposed to serve the U.S. market that have been announced.

Currently, in the gas industry more generally, many fields in the United States are getting more difficult to develop since most of the easy-to-access, highly productive reserves already seem to be accounted for. In Canada, key fields are also maturing while the country is experiencing its own increase in natural gas demand.

At the same time, natural gas demand is growing both overall in the U.S. and in the Everett Terminal's New England home base. There is a significant increase in new natural gas-fired electric power plants, which use less fuel than older, more polluting gas and oil power plants. In addition, there is steady growth in demand for natural gas from residential, industrial, and commercial customers. More specifically, according to the Energy Information Administration (EIA), natural gas production in the U.S. is predicted to grow from 19.5 Tcf in 2001 to about 26.4 Tcf in 2025. At the same time, total natural gas consumption is expected to increase to about 35 Tcf in 2025.

As a result of these factors, many are concluding that LNG represents an important part of the long-term natural gas supply solution.

Currently, anticipated expansions on LNG facilities are expected to raise the United States' import capacity from 1 Bcf per day to 4 Bcf per day by the end of 2004. Applications pending could raise that to 9 Bcf per day by 2007, and other projects under consideration could more than double that by 2009.

The advantages of LNG are clear, but let me take a moment to note the most important ones.

- LNG helps us access the ample supplies of natural gas around the world. Estimates of the total world supply of natural gas hover around 6 quadrillion cubic feet, and more reserves of natural gas continue to be discovered. Much of this natural gas is stranded a long way from market, in countries that do not need large quantities of additional energy. For purposes of perspective, the U.S. natural gas reserves increased by 3.4%, to 183 Tcf, between 2000 and 2001.
- Liquefying natural gas and shipping it is more economical than transporting it in pipelines for distances of more than about 700 miles offshore or more than 2200 miles onshore.

- LNG can contribute substantially a region's energy supply. In the northeastern United States for example, Tractebel provides a substantial portion of the energy used in residential heating and electric generation. For example, our Everett Terminal, which began operation in 1971, is the longest-operating LNG facility in the U.S. It meets 15-20% of New England's natural gas demand, and LNG from our terminal and that from a network of local storage tanks, which for the most part receive their LNG via truck from our facility, is capable of meeting 35-40% of region's demand on peak days.

During the winter of 2002/2003, the terminal achieved its top 10 days of gas deliveries in company history. In addition to heating and other uses, Tractebel is very important to New England's electricity supply. The Everett terminal will supply the fuel for a new 1,550 MW power plant, also in Everett, which can generate enough electricity for approximately 1.5 million homes each year in Greater Boston. In short, if LNG resources were not available in New England, energy supplies would be far tighter and consumers would suffer.

- LNG's technology is improving. Processing and shipping costs have decreased and the technology has improved. The result of all these improvements is that the overall cost of LNG delivery has been reduced by almost 30% over the last 20 years.
- LNG keeps downward pressure on prices by helping to diversify a region's energy supply. By competing openly and fairly with gas delivered via pipeline, LNG helps ensure that consumers get the best deal possible. The industry receives—and desires—no preferential tax or regulatory treatment relative to other competitors in the natural gas industry.
- LNG is a very flexible energy source. LNG import facilities can be upgraded quickly and substantially to meet increases in demand, and more importantly, once in operation can increase or decrease their output very rapidly.

In our specific instance, the Everett LNG Terminal is a major supplier that helps to keep supply relatively stable, particularly on peak days. For example, the Maritimes and Northeast Pipeline from eastern Canada (which is the main Canadian supplier to New England) experienced a delivery problem in January 2000. The company also experienced a production problem in January 2003, which further tightened supplies. Absence of LNG during these periods would have resulted in gas utilities' not being able to serve residential customers.

NEXT STEPS

Having talked a bit about the technology of LNG, and the larger marketplace in which we find ourselves, I think it might be helpful for me to give you an idea of what we think about the future of the energy industry in general, and the LNG industry specifically. Those thoughts fall into a few broad categories.

First, LNG needs to be thought of as complementary to our current resource base, rather than a substitute for it. This is a very important point. Policymakers cannot and should not allow our very sensible and successful approach to LNG to obscure the fundamental reality that we need to better access and develop our Nation's natural resource base.

We agree with the American Chemistry Council, which wrote the following to Chairman Domenici in January 2003: "The U.S. must increase its domestic production of natural gas. Recent legislative, regulatory and market trends have placed greater demands on our gas supply without taking commensurate steps to increase production. Congress needs to ensure adequate supplies, produced in an environmentally protective manner. . . . Access to new reserves is necessary not only to meet new demands, but simply to sustain current production levels."

Second, precisely because it provides unique flexibility, LNG will continue to grow as a resource for the United States. In our ongoing effort to diversify our supply of energy, LNG's exceptional and exclusive ability to transport what was once stranded natural gas from various sources can only help. In short, increased access to global reserves of energy helps us reduce our dependence on any one source.

Additionally, as response to demand becomes more important, our ability to move natural gas to where it is needed, freed in part from the constraints of pipelines, will ensure that LNG is an increasingly important element in our Nation's energy supply portfolio. Simply put, LNG offers greater trade flexibility than pipeline transport, allowing cargoes of natural gas to be delivered where the need is greatest and the commercial terms are most competitive.

This trend can already be seen. As the Energy Information Administration has noted, LNG imports have increased by more than 13 times—from 18 Bcf in 1995 to nearly 240 Bcf in 2001. Factors ranging from additional sources of supply to low-

ered costs for liquefaction and shipping have contributed to the increase. Recent proposals for new LNG facilities include at least five terminals to serve the California markets, three terminals to be built in the Bahamas (to serve the Florida market via undersea pipelines) and a floating semi-mobile offshore facility.

Third, LNG can and must be an important participant in long-term markets. Currently, there seems to be a misapprehension that LNG is solely a spot-market phenomenon. The reality is that it is an important component in the long-term energy markets. Our company both buys and sells much of its LNG under long-term contracts; doing so helps provide certainty, both for us and our customers.

SAFETY

Finally, let me address—and hopefully put to rest—the very important issues of safety and security.

First off, I want to note that LNG is as safe, if not safer, to transport and store than most other fuels. It is not explosive, corrosive, carcinogenic, or toxic. It does not pollute land or water resources. It is not transported or stored under pressure.

Like other fuels, LNG has risks associated with its improper handling; however, LNG has certain characteristics which minimize some of the dangers that may result from mishandling. For example, compared to other fuels, LNG is less likely to ignite in a well ventilated area.

With respect to the transportation, LNG ships, with their double-hull construction, are among the best-built, most sophisticated, most robust in the world. According to shipping expert *Lloyd's Register*, there has never been a recorded incident of collision, grounding, fire, explosion, or hull failure that has caused a breach to a cargo tank of an LNG ship. In fact, over the last 40 years there have been 33,000 LNG carrier voyages, covering more than 60 million miles without major accidents or safety problems either in port or on the high seas.

It is also important to note that in the extremely unlikely event that an LNG vessel were involved in an incident that ruptured a cargo tank, and the LNG vapor released met with an ignition source, the likely consequence would be a localized fire, and not an explosion as is often feared.

With respect to the storage of LNG, there has never been a report of any off-site injury to persons or damage to property resulting from an incident at any of the LNG import terminals currently in operation worldwide, including our Distrigas terminal in Everett, Massachusetts. This is due to excellent equipment and facility design, excellent safety procedures employed in the industry, stringent design and safety codes governing design, construction, and operation of storage facilities, and a well-trained, highly experienced workforce.

Our company has always had a deep commitment to safety and security, but after September 11th, we developed an even greater commitment, increasing our already substantial investments in personnel, equipment, and varied services. These investments include:

- Private security personnel
- Enhancements to the perimeter of the Everett Terminal
- Municipal police and fire details
- State Police details
- Investment in two high-powered tugboats. These tugs include state-of-the-art fire control equipment to offer unprecedented marine towing and firefighting capabilities to the Port of Boston.
- Development of detailed security plans with deployment based on Homeland Security and USCG threat levels

In short, Tractebel is a pacesetter in public-private partnerships. The LNG carrier *Berge Boston*, which is under a long-term charter to us, is the first vessel in the world to meet the new International Code for the Security of Ships and of Port Facilities certification. Other ships in the company's portfolio will soon follow that lead. In addition, our work with the U.S. Coast Guard to bring LNG ships into the Port of Boston became the model for the Coast Guard's Operation Safe Commerce Project, a nationwide effort initiated after September 11th to enhance transportation safety and security while facilitating commerce.

Thank you again, Mr. Chairman and Members of the Committee for inviting me to present our thoughts on possible approaches to help moderate natural gas prices and, more specifically, the role of liquefied natural gas in the larger marketplace. I look forward to answering any questions you might have and working with the Committee on these very important issues.

The CHAIRMAN. We are going to have to run. You see, the lights say we are. But we will be back, Mr. Ferguson, Mr. Thompson.

Mr. Grant, I think your testimony, for the restraints, constraints we put on you of being brief, was excellent. I appreciate it very much and enjoyed it.

Mr. GRANT. Thank you.

The CHAIRMAN. We will be back shortly to hear from the remaining two witnesses. We are in recess.

[Recess from 12:08 p.m. to 12:45 p.m.]

Senator CRAIG [presiding]. The full committee will be back in order and let us turn to Brian Ferguson, chairman and CEO of Eastman Chemical, Kingsport, Tennessee.

Mr. Ferguson, welcome to the committee. Please proceed.

STATEMENT OF J. BRIAN FERGUSON, CHAIRMAN AND CEO, EASTMAN CHEMICAL COMPANY, KINGSPORT, TN

Mr. FERGUSON. Thank you, Mr. Chairman. I very much appreciate this opportunity to appear before you to discuss the impact of soaring natural gas prices and possible solutions.

Today I want to share with you Eastman's enthusiasm for one solution in particular, the production of electricity through coal gasification. As has been mentioned by others, the prices for natural gas in the United States are now the highest in the world, largely as a result of what you saw on this chart earlier. Chemical companies like Eastman depend on natural gas not only as an energy supply, but also as a raw material. This is contrary to our European competitors, who derive most of their raw materials from globally traded oil feedstocks. As a result, the current situation threatens the entire U.S. chemical industry as we try to compete with this now-disadvantaged feedstock.

Short to medium term, solutions include reducing natural gas demand and increasing natural gas production, as was discussed in the first panel. Long term, however, Federal environmental, energy, and economic policies must achieve better alignment. It is economically unsustainable to continue policies that drive natural gas demand while simultaneously limiting access to natural gas supplies and without providing a balancing energy alternative.

One of the long-term alternatives to help alleviate this natural gas crisis is by tapping into America's vast coal reserves through the use of competitive coal gasification technology to reduce natural gas demand. Eastman is a pioneer in the commercial use of coal gasification to produce chemicals. In the early 1980's we installed two large Chevron-Texaco gasifiers at our Kingsport, Tennessee, chemical manufacturing complex. The original plant was completed in 1983 and we have made continuous process improvements since then.

Now, as we celebrate our 20-year milestone, Eastman is widely recognized as the leading coal gasification operator in the United States. To leverage our leadership position, Eastman has recently formed a subsidiary to help other gasification project owners to achieve faster startup, to maximize their plant value, and to improve the long-term performance of their plants.

As Eastman has marketed our gasification expertise, we have repeatedly encountered three questions about coal gasification-based electrical powerplants: One, how expensive are they to build and

operate? Two, are they reliable? Three, what are the environmental benefits? These three questions are pertinent to this morning—this afternoon's hearing, so I will try to answer each in turn.

Question one: How expensive are coal gasification powerplants to build and operate? Mr. Chairman, based on our 20-plus years of operating experience, we believe that coal gasification can be competitive right now and is becoming more cost competitive with each passing day. Let me cite some specifics.

According to data compiled by Eastman, Chevron-Texaco, GE, and others, the capital costs of coal gasification powerplants are currently projected to run between $1,200 and $1,400 per kilowatt of capacity and are trending downward. This compares favorably with the newest generation of pulverized coal plants, which have projected capital costs in the same range, but are trending upward as a result of new environmental control restrictions.

Although operation and maintenance costs are somewhat higher for coal gasification plants, these costs are offset by lower fuel costs from higher efficiency and by lower environmental treatment costs and waste disposal costs. In addition, the coal gasification process produces saleable byproducts by removing over 99 percent of the sulphur.

As additional commercial coal gasification plants are built, the cost competitiveness of this environmentally superior technology should become more evident.

Number two, how reliable are coal gasification powerplants? Mr. Chairman, this is a question that Eastman is uniquely qualified to answer. Our system, with its dual gasifiers, has achieved an average on-stream availability of 98 percent since 1984 and an estimated single gasifier availability of 90 percent. Perhaps most remarkable, our forced outage rate is only about 1 percent. Further, Eastman has continuously improved the performance of our gasification processes. The time between gasifier switches, for example, is now about once every 2 months, which is a six or sevenfold improvement since 20 years ago.

Another useful measure of performance is maintenance costs. In the last 6 years alone, our maintenance costs have declined by more than 40 percent.

Now, importantly, question number three, brought up earlier by one of the other Senators: What are the environmental benefits of coal gasification? Let me answer that directly. The principal environmental benefits associated with coal gasification as compared with coal combustion processes are: In the short term, you remove over 99 percent of the elemental sulphur, nearly all of the mercury, and you also have lower NO_X. In the long term, it can be a more cost efficient way of sequestering carbon dioxide because it is collected in very concentrated streams.

There are many more environmental benefits of gasification, but the take-away from this is one simple fact: Coal gasification is the cleanest of the clean coal technologies.

Before concluding, let me express Eastman's support for both FutureGen and the Clean Coal Power Initiative. Like any business, the electric power industry must understand new technologies before they implement them. Thus, even though Eastman believes that coal gasification is ready for commercialization right now,

some additional market incentives such as the CCPI and the proposed clean coal tax credits are useful and necessary inducements to those industries. We thank the members of this committee for your leadership on these specific issues and on advancing coal gasification in general.

Mr. Chairman, let me summarize my testimony. First, the natural gas crisis you heard about today is real. It is severely impacting U.S. industry in general and the chemical industry specifically. Secondly, short- to mid-term solutions include energy conservation and increasing natural gas and LNG supplies, as you heard. Third, long-term solutions must include more reliance on clean coal, our most abundant fossil fuel, and that will in turn reduce our natural gas demand. Eastman believes that this is economically competitive with other clean coal processes now.

Finally, as Eastman has proven through 20 years of experience, coal gasification plants can be operated at maximum efficiency with a high degree of reliability.

Mr. Chairman, speaking on behalf of my company, on behalf of my industry, and as a citizen, we are all very concerned that we are walking down the same road with natural gas that we have already walked with oil. The technology I am testifying on today is not a theoretical future thing that has not happened. For us it is just another day at the office, and it is an economic, reliable, environmentally friendly, practical technology that really does give us choices right now.

Thank you very much for this opportunity and I will await your questions.

[The prepared statement of Mr. Ferguson follows:]

PREPARED STATEMENT OF J. BRIAN FERGUSON, CHAIRMAN AND CEO, EASTMAN CHEMICAL COMPANY, KINGSPORT, TN

SUMMARY

Eastman Chemical Company is a globally competitive chemical company that manufactures intermediate chemicals from natural gas, coal, petroleum-based, and wood-based feedstocks. Like the chemical industry in general, Eastman also uses natural gas and coal for making steam heat and electricity used in its manufacturing processes. Unlike others in the chemical industry, Eastman is a pioneer in using coal gasification to produce chemicals. Coal gasification is among the major rational responses to present and foreseeable natural gas shortages and price increases. Other responses include conservation, increased access for exploration and drilling, and imports of LNG.

The present natural gas shortage and the foreseeable natural gas crisis adversely affect American chemical manufacturers including Eastman, and the wider U.S. manufacturing sector. Natural gas supply shortages and price increases have resulted from conflicting and long-standing environmental policies that have limited access for exploration and production, while simultaneously driving electric power generation and other demand for natural gas. Natural gas is a regional fuel and chemical feedstock with little global trade.

Electricity demand is relatively inelastic with regard to price. The economically regulated domestic electric utility sector is able to pass through natural gas costs to ratepayers with little resistance. Electricity demand growth drives relentless increases in natural gas consumption and prices, while domestic industrial natural gas consumers are rendered uncompetitive in a world market and chemical production is shifted to foreign sources with lower feedstock costs. Since industry is the marginal consumer, "demand destruction" will result, without new natural gas supplies or fuel substitutions for electricity. As a consequence, job losses and economic downturn could be substantial.

Immediate action is necessary to mitigate damages of demand destruction. These immediate actions include conservation through reduction in peak consumption of

electricity, utility fuel switching to distillates, and reconsideration of environmental requirements to allow fuel substitutions. Medium-term actions include increasing access for exploration and drilling of natural gas and increasing LNG port facilities and capacities.

Finally, in the absence of substantial nuclear power or renewables growth, medium and long-term actions will require reversal of the decline in the proportion of coal-based electricity generation, and improvement in coal-fleet productivity not seen since before the early 1960s. Coal is the most abundant and price-stable fossil energy resource in the United States. Chemical industry history strongly suggests that abundant and low cost feedstocks, market competition, and stable geopolitics are major factors in technological innovation and economic sustainability. Coal gasification is the coal technology that offers the best opportunity to support environmentally responsible and competitively sustainable basic manufacturing and electricity generation in the United States. Coal gasification is also the coal technology bridge to the Hydrogen Economy because it is the only technology that can directly convert coal to hydrogen.

In the absence of market structure that resembles global competition and absent environmental policy that rewards the superior performance of coal gasification, federal funding of RD&D (research, development, and demonstration) and tax credits for commercialization of coal gasification technology in the electric utility market will be necessary. Federal funding is necessary to overcome long-standing risk averse behavior and achieve initial technology transfer with foreseeable follow-on technology improvements (e.g., Clean Coal Power Initiative, and FutureGen, carbon sequestration and a hydrogen economy). Electric utility market restructuring would likely drive economic benefits of coal gasification technology faster, deeper, and wider. As broad basic industry, gasification facilities can be configured for "polygeneration;" i.e., operational flexibility to make chemicals, liquid fuels, fertilizer, hydrogen, and generate electricity (including via fuel cells), as open and competitive market conditions dictate.

EASTMAN AND GENERAL CHEMICAL INDUSTRY BACKGROUND

Beginning in the middle of the 19th century in Europe, chemistry became the first science-based, high technology industry. The chemicals industry has since generated technological innovations for other industries, such as automobiles, rubber, textiles, construction, publishing, entertainment, and metals. The industry illustrates the general tendency for internationally competitive industries to spillover, spin-on, and spin-off other industries. Until now, with cheap, abundant natural gas, the American chemical industry has been a success story and is one of the few major high-technology industries in which the United States has maintained its competitive lead in international trade. The chemical industry growth rate has exceeded that of the overall economy since World War II.

Eastman is a prime example of the evolution of the U.S. chemical industry out of German chemical import shortages that developed during World War I. In 1920, George Eastman founded Eastman to provide a stable source of chemicals for Eastman Kodak Company's photographic business. In addition to the effects of geopolitical conflict, anti-trust law shaped a focus by George Eastman on R&D as a means to achieve continued growth.[1] These two longstanding Eastman performance characteristics of globally competitive and stable supplies and continuous internal innovation have shaped Eastman's present leadership in coal-gasification technology.

Eastman became independent from Kodak in 1994. Today Eastman is the largest producer of polyethylene terephthalate ("PET") polymers for packaging, based on capacity share, and is a leading supplier of raw materials for paints and coatings, inks and graphic arts, adhesives, textile sizes and other formulated products, and of cellulose acetate fibers and acetyl chemicals. Eastman has 41 manufacturing sites in 17 countries that supply major chemicals, fibers, and plastics products to customers throughout the world. Revenues in 2002 were $5.3 billion.

FEEDSTOCKS, TECHNOLOGY, AND GEOPOLITICAL STABILITY: MAJOR FACTORS THAT SHAPE THE GLOBALLY COMPETITIVE CHEMICAL INDUSTRY

For Eastman, as for the U.S. chemical industry in general, natural gas is an essential fuel and raw material. Between 1920 and 1930, automotive demand, petroleum resources, and a large American market stimulated the rise of the domestic petrochemical industry and the development of continuous-process technologies.

[1] Paths of Innovation: Technological Change in 20th Century America, David C. Mowery and Nathan Rosenberg, Cambridge University Press, 1998, pp. 14-15.

With process technology cost improvements, during the interwar years the U.S. chemical industry shifted from coal to petroleum and natural gas feedstocks.[2]

In contrast, the German chemical industry, throughout the period of 1890 to 1945, focused on development of synthetic products from coal such as synthetic ammonia and gasoline. One of the most important developments of the 20th Century was the Haber-Bosch process for nitrogen fixation (critical to agriculture and the military) developed and commercialized by BASF in 1913. Despite governmental expropriation of U.S. patents of BASF technology in 1918 and a wartime program at Muscle Shoals, Alabama, American experts could not replicate the Haber-Bosch process. Only after WWII were the catalytic technology and the construction information for high-pressure equipment mastered, along with a prolonged learning experience in scaling-up from the laboratory to commercial operations.[3] Natural gas displaced coal as preferred feedstock for ammonia manufacture.

World War II also transformed the rubber industry. Synthetic rubber was the first synthetic polymer to be produced in major quantities from petroleum-based feedstocks. The program for this transformation was second only to the Manhattan Project in the mobilization of human resources. However, the federal government invested $700 million to construct 51 plants to produce the necessary chemical intermediates for synthetic rubber manufacture. These plants were sold to private firms by the mid-1950s.[4]

World War II effectively reduced technology and patent-based barriers to entry resulting in a rapid growth in firms to make plastics. Between 1945 and 1971 production of plastic materials grew at an average annual rate of more than 13 percent. Polyethylene expansion was among the most important results of WWII on U.S. industry. Product development in synthetic fibers began before WWII, but like other post-war synthetics, abundant domestic petroleum and natural gas reserves were key.[5]

By 1950 half of total U.S. production of organic chemicals was based on natural gas and oil. By 1960 the proportion was nearly 90 percent. After WWII German and British chemical production was rebuilt and shifted from coal to petrochemical production. The development of a worldwide market in oil reduced the comparative advantage of petrochemical production in the United States. By the end of the 1960s, Europe and Japan had closed the competitive gap. Since then, relative shares of world output from the U.S., Europe, and Japan have largely remained constant.

Thus, European-based chemical manufacturers are based primarily on globally traded oil feedstocks, while U.S.-based chemical manufacturers are based primarily on a regional feedstock, i.e., natural gas. Federal government policy may explain this fundamental and important difference. Beginning in the late 1930s, the domestic oil industry was regulated to prop up the domestic price of oil. After WWII the regulations extended to restrict oil imports. This created prices for U.S. refineries that were 60-80 percent higher than landed prices in Europe throughout the 1950s and 1960s. This helps to explain the fact that post-war U.S. chemical feedstock reliance is predominantly natural gas, while European reliance is petroleum.[6] Now, in the face of present and foreseeable natural gas shortages, European producers hold a clear competitive advantage.

EASTMAN'S COAL GASIFICATION EXPERIENCE

Many of the chemicals that Eastman produces at our large (8,000-employee) Kingsport, Tennessee, complex are created through chemical reactions involving, at the front-end of the process, simple molecules such as hydrogen (H_2) and carbon monoxide (CO). To produce these molecular building blocks in the large volumes required in subsequent steps of the manufacturing process, our facility has always required great quantities of hydrocarbon raw materials.

However, a 1970 Eastman study predicted that coal would become a more attractive energy source than petroleum and an important chemical feedstock for acetic anhydride (a strategic product for plastics, fibers, coatings, photographic films and pharmaceuticals) in the long term. The location of abundant coal supplies in proxim-

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[2] U.S. Industry In 2000, Studies In Comparative Performance, David Mowery, Editor; "The Dynamics of Long-term Growth: Gaining and Losing Advantage in the Chemical Industry," Ralph Landau, and Ashish Arora, National Research Council, National Academy Press, Washington D.C., 1999, at 24-26.

[3] Paths of Innovation, pp. 74-76.

[4] Paths of Innovation, pp. 89-92.

[5] Paths of Innovation, pp. 87-88, 92-94.

[6] U.S. Industry In 2000, Studies In Comparative Performance, David Mowery, Editor, "Chemicals," Ashish Arora, and Alfonso Cambardella, National Research Council, National Academy Press, pp., 46-47.

ity to its main facility influenced Eastman to act on this prediction. New technology developed by Monsanto in 1970 made existing ethylene-based processes obsolete for production of acetic anhydride. With the oil embargo of 1973 and the natural gas crisis of the late 1970s, Eastman acted to replace natural gas with locally available coal, as the feedstock for stable competitive production of acetic anhydride.[7]

In the early 1980s, Eastman obtained a license from Texaco (now ChevronTexaco) and installed two large coal gasification units using the Texaco technology. The installation was completed in 1983 and continuous improvements have been made. Eastman's coal gasification investment was wholly private.

Twenty years of continuous improvement, driven by global market competition, made the Eastman gasification investment perform at levels of environmental efficiency and reliability unmatched by coal-fired electric utility boilers. Total gasification life-cycle costs are now head-to-head with pulverized coal (PC) technology and trending downward. PC costs are trending upward.

Today a key business objective, particularly in light of the present natural gas crisis, is for Eastman is to use its two decades of coal gasification experience to help other companies design, build, and operate similar facilities for the production of electricity, chemicals, or other end-products, such as hydrogen.

Many experts consider Eastman to be the world's leading gasification operator for the following reasons:

- *First Commercial Facility in the United States.* The Kingsport, Tennessee facility was the first commercial coal gasification project built in the United States. It was built wholly with private funds. Our facility just celebrated twenty years of successful operation.
- *Operating Performance and Availability.* Tennessee Eastman coal gasification has the world's best operating performance. For the last 19 years, Eastman has achieved an average on-stream rate of 98 percent (91 percent in the initial startup year). The annual forced outage rate is now less than one percent. This performance rivals the best PC boiler performance.
- *Safety.* The Kingsport gasification site has achieved an OSHA recordable rate of 1.0 and no lost time accidents in the last 11 years.
- *Environmental Performance.* Eastman's coal gasification facility removes more than 99.9 percent of the sulfur in the synthesis gas (syngas created from coal) and removes nearly all of the volatile mercury present in the syngas stream. Eastman also has a patented sulfur-free gasifier start-up process.
- *Operating Costs.* Continuous process improvements have resulted in a 40+ percent reduction in annual maintenance costs over the last six years.

Eastman is confident that gasification technology is a competitive alternative and has formed a subsidiary—Eastman Gasification Services Company—to help other gasification project owners achieve faster start-up, maximize plant value, and improve long-term performance. Eastman has a cooperative agreement with ChevronTexaco, which allows Eastman to provide operation, maintenance, management, and technical services to other ChevronTexaco gasification licensees.

NATURAL GAS: USE, PRICE, PRODUCTION, DEMAND, CRISIS SOLUTIONS

Use. Natural gas is used by the chemical industry to generate electricity and steam using highly efficient and environmentally sound cogeneration or combined heat and power (CHP) technology. Components of natural gas, including ethane, propane, butane, pentane and natural gasoline are major raw material feedstocks. These components are used to make the "building blocks" of organic chemistry, the backbone of a high technology materials society. The dual role of natural gas makes use efficiency a high priority across the chemical industry. Chemical companies, including Eastman, set public goals to reduce energy needed per pound of product. Market drivers motivate efficiency improvements.

Price. Prices for natural gas in the United States are now the highest in the world. US consumers will now pay $70 billion more for gas in 2003 than in 2002. Record withdrawals from inventories resulted in record low natural gas storage levels in spring 2003. Only record injection rates and mild summer weather will assure adequate supply into the winter. The run-up in natural gas prices beginning in early 2001 was a major contributor to a drop in industrial production after a sustained 10-year rise. The same effect can be expected for 2003, and in the years ahead.

[7] From Coal to Acetic Anhydride, Victor H. Agreda, David M. Pond, and Joseph R. Zoeller, Chemtech, March 1992, 174-175.

Production. In the past, price increases resulted in some increased production. The January 2001 price of over $10.00 per Kcf resulted in a peak drilling rig count of over 1,000. But they operated in mature fields and achieved poor results. With price increases in the summer of 2002, producers did not dispatch rigs to old fields. United States production peaked in 1971; production declines have been experienced over the past 15 years even as the number of rigs and wells tripled.

Demand. Demand for natural gas by industrial, commercial, and residential consumers has grown little in the last 30 years. But demand growth in the electric power sector has been very high, up 40 percent in the past 5 years. Further, demand growth in the electric power sector is expected to double by 2025 and account for 33 percent of end use.[8]

Crisis Solutions. Short-term options to reduce natural gas demand and avert a winter crisis include conservation of electricity consumption during summer peaks. Another suggestion is to encourage power generators to switch to distillate fuels. Medium-term options include efforts to increase domestic natural gas production by opening productive on- and offshore areas. In the long-term, federal environmental, energy and economic policy must achieve better alignment. It is economically unsustainable to establish policy that drives natural gas demand and simultaneously establish policy to limit access to natural gas supplies. Coal-based generation is declining as a percentage of all generation. Policy must encourage greater diversity of renewable energy, nuclear, LNG, domestic production of natural gas, and coal gasification.

THE PROBLEM OF INNOVATION IN ELECTRIC POWER

In the 50 year period between 1907 and 1957, innovation in electric power was most impressive, resulting in significant efficiency improvements in coal mining, coal transportation, conversion to electric energy, delivery of electric energy, and conversion to end use. Household consumption aside, whole industries depended upon the new infrastructure: including steel and aluminum. No doubt, the cumulative effect of the end-to-end electricity system was responsible for the highest rate of total factor productivity of the U.S. economy in the first half of the 20th Century.

But "during the 1960s . . . the long trajectory of productivity improvement came to an abrupt end. . . . Although the causes of the end of this productivity-growth trajectory are by no means fully understood, it is clear that it contained a large technological component.". . . The "productivity-enhancing possibilities in further expansion in the scale of coal-fired generation were exhausted by the mid-1960s."[9]

Thermal efficiency of power plants failed to improve above levels achieved in the early 1960s. Efficiencies had increased on average from 21.8% in 1948 to 32.2% in 1965; by 1980 it was nearly the same (32.8%). Attempts to raise the performance to "supercritical" generating units (1,200 degrees F, and over 4,000 pounds pressure) and larger scale, failed. Beginning in 1970, new environmental requirements began to impose an energy penalty on coal-fired units. Relative prices of electricity began to rise starting in the late 1960s and continuing into the mid-1980s.[10]

In the mid-80s, the opportunity for driving thermal efficiencies presented itself in coal gasification combined cycle technology (CGCC) with demonstration of the Cool Water project.[11] But the technology was dropped by the electric power sector soon thereafter as it turned to natural gas. Ten years later, two DOE funded CGCC demonstration projects (each approximately 260 MW) were built that operate today. After four decades of stagnant thermal efficiency, and nearly twenty years since Cool Water, the improvement opportunity is still coal gasification combined cycle technology. This technology is currently approximately 40 percent efficient, with the promise of 50 percent efficiency in the near future (i.e., 10 years) and perhaps 60 percent efficiency with hydrogen fuel cell technology.

But except for two 50 percent federally-funded coal gasification projects in the late 90's, the coal-fired, risk averse, largely economically regulated, electric utility sector took no risks to exploit the benefits of gasification technology. Regulated market structure, combined with environmental policy, precluded coal technology risk-taking and narrowed generation capacity growth options to natural gas and its consequential natural gas "demand destruction."

Against the dead-end of CGCC in the electric power sector, Eastman's contemporaneous investment and continuous operation of Texaco gasifier technology, and

[8] EIA Annual Energy Outlook 2003 at 77.
[9] Paths of Innovation, Electric Power, at 116.
[10] Paths of Innovation, Electric Power, at 120-121.
[11] Cool Water (USA), 100 MW, ChevronTexaco, 1984-1985.

its stunning success, is an irony explained in part, by the basic market differences between the chemical and electric utility sectors.

ONE SOLUTION TO THE NATURAL GAS CRISIS: COAL GASIFICATION COMBINED CYCLE TECHNOLOGY

Coal gasification combined cycle technology now offers a serious alternative to PC technology and thereby a chance to reverse the decline in the coal based market share of domestic electricity generation. There are primarily three reasons for this. First, the costs of CGCC are now roughly at parity with PC units and declining, while PC costs are rising. Second, CGCC, based on Eastman experience, can be every bit as reliable and available as any PC unit. Third, the environmental benefits of CGCC technology are far greater than any other coal technology. Additionally, the potential for yet greater cost reduction, efficiency, and environmental performance gains are unrivaled by any other coal technology.

COSTS

Capital Expenses. According to data compiled by Eastman, ChevronTexaco, GE, and others, the capital costs of coal gasification power plants are currently projected to run between $1,200 and $1,400 per kilowatt of capacity and are trending downward. This compares favorably with the newest generation of pulverized coal power plants, which have projected capital costs in the same range.

Pulverized coal capital costs have risen in recent years as the result of ever-tightening federal air pollution and other environmental regulations. Coal gasification, on the other hand, has fewer potential environmental side-effects, and the capital costs of such plants are decreasing as accumulated learnings are incorporated into new designs and as the electric power industry gains more familiarity with the technology. [See Figure 1]

Operational Costs. Although operation and maintenance costs are somewhat higher for coal gasification plants, these costs are offset by lower fuel costs (from higher efficiency and reduced total fuel costs) and by lower environmental treatment costs and subsequent waste product disposal costs. In addition, the coal gasification process produces saleable by-products, such as elemental sulfur.

Total variable costs—O&M, fuel, waste product disposal, and by-product credits—are currently lower for coal gasification than any other fossil fuel-based electric power generation technology, including natural gas. Moreover, the costs associated with the removal of volatile mercury and with carbon dioxide capture and sequestration (if and when such removals are required) are much less for gasification than for competing technologies. [See Figure 2]

Fuel Costs. In general, coal gasification is competitive with natural gas when natural gas prices are in the range of $3.50-4.00/million Btu. Many energy experts now predict that natural gas prices will remain above $5.00/million Btu through most of this decade. Sustained natural gas prices at that level would continue to harm America's chemical industry.

In summary, when comparing capital costs, operational costs, and fuel costs, the generation of electricity from coal gasification can be competitive now. As additional commercial-sized coal gasification plants are built, the cost-competitiveness of this environmentally superior technology should become more evident, especially if the best practices Eastman has developed over the years are incorporated into future designs and operations.

AVAILABILITY AND RELIABILITY EASTMAN HAS SUCCESSFULLY OPERATED A MAJOR COAL GASIFICATION SYSTEM FOR THE LAST 20 YEARS, LONGER THAN ANY OTHER COMPANY IN THE UNITED STATES.

Operating a coal-to-chemicals facility is considerably more complicated than a coal-to-electricity power plant. But the basic coal gasification process is the same regardless of whether the ultimate end-product is chemicals or electricity. [See Figure 3]

Availability. Eastman's gasification system has achieved an average on-stream availability of 98 percent since 1984. Even during the initial startup year, on-stream availability was 91 percent. Perhaps most remarkably, the forced outage rate is now only about one percent. While this extraordinary performance is due in part to that fact that there are two gasifiers, with one unit always serving as a "hot standby," even the single unit availability rate is estimated to be 90 percent. [See Figure 4]

The extraordinary Eastman availability rates are due in part to the global competitive standards of the industry and the time-honored standards of the company. The potential costs of an unplanned shutdown are incredibly high.

Performance. Eastman has continuously improved the performance of the gasification system during the last two decades. In 1983, for example, gasifiers were switched weekly. In 2002, the average time between switches was 62 days. Another useful measure of performance is maintenance costs. In the last six years alone, annual maintenance costs for the gasification system have decreased by over 40 percent. [See Figures 5 and 6]

ENVIRONMENTAL BENEFITS

The principal environmental benefits associated with coal gasification are: (1) significantly lower air pollution emissions in the short-term; and (2) more cost-efficient carbon dioxide (CO^2) capture and sequestration in the long-term.

In the future, America's electricity requirements may be met primarily by renewable energy sources such as wind and solar or perhaps even by nuclear fusion. It is prudent for America to explore those options. However, it is obvious to anyone who has studied our nation's energy situation in depth that coal can and must continue to play a leading role over the next several decades (at a minimum).

Unfortunately, there are two major environmental issues the public associates with traditional coal combustion processes and even with much newer (and cleaner) coal combustion technologies: criteria pollutants and mercury; and carbon dioxide. When coal is burned it produces certain air pollutants, most notably sulfur dioxide (SO_2), nitrogen oxides (NO_X), particulate matter (PM), and mercury (Hg). In coal-fired power plants these pollutants must be removed from the exhaust (stack) gases using expensive and often relatively inefficient processes.

The combustion of coal also produces substantial quantities of CO^2. If and when CO_2 capture and sequestration is eventually required, it will be difficult and prohibitively expensive for coal-fired power plants to meet such requirements.

By contrast, coal gasification is a chemical process. As such, it is possible to remove the sources of SO_2 and Hg and the CO_2 from the synthesis gas before combustion, when it is much easier and thus less expensive to remove. Also, because the syngas is much cleaner than the raw coal itself, lower quantities of NO_X and PM are produced during the combustion process. [See Figure 7]

There are many more environmental benefits of gasification such as minimal solid waste generation, nominal water consumption, and the generally pleasing aesthetics of facilities and operations. Coal gasification is by far the cleanest of the clean coal technologies.

GASIFICATION MARKET BARRIERS

Until recently, the usual market barriers to CGCC technology or polygeneration (facilities that make multiple products from coal gasification) have been low cost natural gas, high capital costs, and regulatory and management resistance to technology transfer.

Today natural gas costs appear to have increased and will remain high for the rest of the decade. Capital costs for CGCC have declined substantially, and unless efficiency requirements are added to protect competing technology, capital costs will remain competitive and decline with a few generations of construction and operation of base-load commercial scale facilities. Greater efficiencies will be realized by RD&D and commercialization. But here at least, a domestic, economically regulated market does not have the incentives comparable to global competition that would take RD&D, and commercialization risks, to adopt gasification technology and then achieve higher performance efficiencies.

The superior environmental benefits of coal gasification compared to either existing coal plants or to other new clean coal technologies have largely been unrewarded by regulators. Coal gasification is by far the cleanest of the clean coal technologies, with potential to remove almost all volatile mercury and to reduce the criteria pollutants to levels that are a fraction of the levels achieved by other coal processes. Capture and sequestration of carbon dioxide from coal gasification can also be readily done, but at a current cost and efficiency penalty.

However, the penalty is only a fraction of that for other coal technologies. Failure to reward the benefits of gasification's enhanced environmental performance and capability through either regulation or incentives has been, and continues to be, a market barrier to commercialization of this superior but emerging technology. So long as carbon constraints are uncertain, any coal-based technology, including gasification, faces barriers.

However, the most perplexing barrier may be the fact that this technology has been, and continues to be largely foreign to the electric utility sector. Familiarity could come through more robust competition, as in the global chemical industry. However the prospects for more competitive electricity generation markets do not

appear great. The traditional and ritualized nature of utility ratemaking simply appears unable to simulate the effects of global markets, particularly the risks and rewards of innovation.

Regulatory commissions long ago opted to accept low capital cost natural gas based generation and their potential for high variable fuel costs. CGCC has high capital costs, but low variable costs, and environmental benefits that go beyond compliance. Reliability, surely a function of human resources, has been affirmatively proven outside the utility sector, but not persuasively within the sector.

The opportunity costs of the regulatory barriers are many. Coal reserves are exhausted sooner for lack of application of the more efficient technology. Environmental loadings are unnecessarily high. Natural gas remains the fuel of choice to meet new electricity demand growth. Natural gas demand destruction in the domestic industrial sector continues unabated. The innovation of a creative, globally competitive and critical infrastructure sector of the U.S. economy is simply consumed and production is driven overseas. Jobs are lost.

In the absence of market restructuring, the next best alternative is to engage in federal funding of RD&D and commercialization through investment and production tax credits. Thus Eastman supports this federal role for two reasons. First, industry generally views the role of government in the national technology enterprise as reducing risk on large-scale research projects, and providing a level playing field for U.S. industry. A federal role here will reduce risks, and the playing field needs to be made more level between the utility and industry sectors to maintain global competitiveness, particularly in the U.S. chemical sector. Second, when it comes to clean, sustainable energy domestically and world-wide, there are very few actionable ideas, i.e., there is little long-term vision about what technologies might become available to meet significant need.[12] Coal gasification technology offers a long-term vision that meets multiple objectives: economic, energy, environment, materials, and manufacturing competitiveness.

FUTUREGEN AND THE CLEAN COAL POWER INITIATIVE

Eastman supports FutureGen and the Clean Coal Power Initiative (CCPI), two research, development, and demonstration programs initiated by the Bush administration.

FutureGen. Eastman supports this program. Current market circumstances strongly suggest that government must lead the way in demonstrating both the feasibility of large-scale hydrogen production from coal and the sequestration of carbon dioxide from coal-based power plants. If properly conceived and executed, FutureGen could help achieve these two purposes while accelerating the commercialization of coal gasification. However, Eastman is concerned that budget constraints in future years will make the 80 percent federal funding commitment to FutureGen difficult to sustain.

If forced to choose between funding for FutureGen and the Clean Coal Power Initiative, Eastman would choose the latter. The CCPI program—with its biennial competitive solicitations provides a long-term source of support for a diverse array of technologically promising but commercially risky coal gasification process improvements. While the goals of FutureGen are laudable, the CCPI is more important for incremental improvements in coal gasification.

Also, if the FutureGen project does go forward, Eastman agrees with our colleagues on the Gasification Technologies Council (GTC) that this project ought to be designed and executed in close collaboration with the gasification industry.

Attached to this statement, for inclusion in the record, is a copy of the comments submitted by the GTC to the Department of Energy on the FutureGen proposal. The position of the gasification industry on the FutureGen project is set out in detail in this document.

Clean Coal Power Initiative. Eastman supports the Senate version of the CCPI program. H.R.6 includes a requirement that at least 60 percent of the CCPI funds "shall be used only for projects on coal-based gasification technologies, including gasification combined cycle, gasification fuel cells, gasification co-production, and hybrid gasification/combustion." Eastman supports an 80 percent level as presently pending before the Senate. (This position was recently supported by a report from the National Research Council.)

The electric power industry is highly regulated and hence conservative when it comes to embracing new technologies. Thus, even though Eastman believes that coal

[12] New Forces At Work: Industry Views Critical Technologies, Steven Popper, Caroline Wagner, Eric Larson, RAND, Critical Technologies Institute, funded by Office of Science and Technology Policy, 1998, at 61-62, 92.

gasification is ready for further commercialization right now, some additional market incentives such as the CCPI and the proposed clean coal tax credits are useful and necessary inducements.

CONCLUDING THOUGHTS

The gasification services team at Eastman Chemical Company has spent a lot of time contemplating the barriers-both real and perceived—to widespread acceptance of coal gasification by the electric power industry. Many of the perceived barriers have been addressed above. To summarize Eastman's position—

- The natural gas crisis is real and the near, mid- and long-term solutions include:
  - —new supplies (increased access and production, LNG imports);
  - —conservation, efficiency, fuel switching to distillates;
  - —meeting new and existing electricity demand by substituting natural gas based generation with coal-based generation, particularly coal gasification; and
  - —leveling the competitive playing field between the chemical and electric utility sectors;
- Gasification is economically competitive with other clean coal processes and offers cross-sector benefits: electricity, chemicals, general manufacturing, and agriculture. Barriers exist that can be removed to fully realize these benefits.
- Gasification is the environmentally superior coal-based technology and holds great promise for transition to a Hydrogen Economy.
- And, as Eastman has proven through 20 years of experience, coal gasification plants can be operated at maximum efficiency with a high-degree of reliability.

[The following attachments have been retained in committee files.]

Fig. 1. Gasification Capital Cost Trends
Fig. 2. Cost of Electricity Comparison
Fig. 3. The Flexibility of Coal Gasification
Fig. 4. Forced Outage Rate of Eastman's Gasification Plant
Fig. 5. Days Between Gasifier Switches for Eastman's Gasification Plant
Fig. 6. Maintenance Costs for Eastman's Gasification Plant
Fig. 7. Syngas Contaminants Removed Prior to Combustion
Letter from the Gasification Technologies Council regarding the FutureGen project

The CHAIRMAN [presiding]. Thank you very much.

Could you tell me, how big is Eastman Chemical sizewise?

Mr. FERGUSON. We have worldwide revenues of approximately $6 billion. We employ 16,000 people and we are in nearly every country of any size in the world.

The CHAIRMAN. Your principal business today is?

Mr. FERGUSON. Petrochemicals and fibers and plastics.

The CHAIRMAN. Thank you very much.

Bruce Thompson, would you please testify now.

STATEMENT OF BRUCE THOMPSON, EXECUTIVE DIRECTOR, PUBLIC AND INDUSTRY AFFAIRS, FOREST OIL

Mr. THOMPSON. Yes, Mr. Chairman. Thank you. It is a pleasure to be here today. I appreciate this opportunity——

The CHAIRMAN. I am sorry for the delay.

Mr. THOMPSON. Oh, no problem at all. I understand.

There are three points that I would like to make at today's hearing. The first is that the current natural gas situation was foreseeable and was in fact forewarned. Second, that there are no short-term solutions; however, we must learn from the situation we find ourselves in and use it as a basis to make better policy choices going forward. And third, there will be some who advocate failed policies of the past, such as fuel use allocation or restrictions on gas use or controlling prices, and we think we are strongly in favor of avoiding these choices.

Taking my last point first, some have proposed that new natural gas electricity generation capacity be prohibited or restricted. This would be a serious mistake. Natural gas generation capacity is a source of clean power, it is very efficient, and these new and efficient facilities are much better than what is currently on stream and we should encourage this type of capacity rather than discourage it.

It is essential to recognize that the current gas situation is the consequence of past decisions. We have had a number of reports over the years, both private and government-funded, that told us we had an adequate resource base, but that we were going to have to develop policies to access the resource base appropriately. We ignored these clear signals for appropriate policy development.

In terms of solutions, the current challenge we have is to simultaneously address short-term needs and to alter policies to produce better results in the future. There are four options that we see as important:

First, of course, as we have discussed, is demand limitation or conservation. That is an important piece. The use of LNG is also important; development of Arctic natural gas sources; and the improvements in the lower 48 and offshore. In the short term, demand alterations are really the only realistic option to do anything today. The IPAA and the Domestic Petroleum Council both believe that the attention should be directed toward conservation measures that can be implemented in the short term.

However, we must be careful not to generate—let this slip into demand destruction rather than demand reduction. We do not want a negative impact on the economy.

LNG is a critical component, as we have heard today, and I would support Chairman Greenspan's remarks along those lines, as my other colleagues here at the table. Additionally there is Arctic gas, Canadian gas, and Alaskan gas that will be available, but it is a long ways out. It is 4 years to 10 years depending on the estimate you look at.

The responsible solution for the expansion of supply is to develop our lower 48 resources and we need an improved approach to do that. Much of these resources are on Federal lands. A perfect example in the way we have done this responsibly over the years is, as the chairman has noted and the other Senators have, the western and central Gulf of Mexico have been a source of natural gas supply for over 25 years and it has done very, very well.

A number of other offshore areas are under moratoria today. These policies are predicated on events that occurred long ago and on technology that has long since been outdated. We need to reexamine these policies in light of current technology.

In addition, we must not overlook the importance of public education, as we have talked about here today.

A lot of today's lower 48 gas resources are concentrated in the Intermountain West and these are resources that we need to have greater access to and be able to go at these resources in a responsible manner, which we have proven we can do over time.

There is also a strategy that some of the opponents of development have evolved over the years and that is one of litigation to starve our development efforts. A classic example of this is what

has happened in the Powder River Basin, and that is really highlighted more in my written testimony and I will not spend time on that here. But that is one that has been a long delay for the industry and has caused a shortage of capital coming in.

Like any industry, ours requires capital. The historical extreme price volatility generates uncertainty and it discourages inflows of necessary capital which are required to sustain supply at affordable prices. The current policies that we have have pushed us to this point.

Going forward, the ideal policy would be one which encourages and permits reasonable and responsible access to the resource base, resulting in a smoother price cycle, fewer and less extreme price spikes and plunges, less uncertainty, and a sustainable, affordable, secure supply of natural gas.

I thank the committee for this opportunity and I appreciate this chance to testify and I look forward to your questions.

[The prepared statement of Mr. Thompson follows:]

PREPARED STATEMENT OF BRUCE THOMPSON, EXECUTIVE DIRECTOR, PUBLIC AND INDUSTRY AFFAIRS, FOREST OIL CORPORATION

Mister Chairman, members of the committee, I am Bruce Thompson, Executive Director Public and Industry Affairs, Forest Oil Corporation. This testimony is submitted on behalf of the Independent Petroleum Association of America (IPAA), the National Stripper Well Association (NSWA), the Petroleum Equipment Suppliers Association (PESA), the Association of Energy Service Companies, and 34 cooperating state and regional oil and gas associations. These organizations represent petroleum and natural gas producers, the segment of the industry that is affected the most when national energy policy does not recognize the importance of our own domestic resources.

The purpose of the hearing is to discuss the reasons behind the high price of natural gas, its effect on the economy and to consider potential solutions. While this testimony will address these issues in more detail, there are three key points that it will emphasize.

First, the natural gas price situation that is now being addressed was foreseeable and, in fact, was forewarned.

Second, there are no simple, short-term solutions. However, what has happened can be the basis for making better policy choices in the future and those choices need to be made.

Third, there will be some who will advocate the failed policies of the past policies like limiting the use of natural gas or controlling its price. These choices must be avoided. Their past failures alone demonstrate that they will not result in the development of the natural gas supply that is needed to meet demand.

AVOIDING BAD CHOICES

Taking this last point first, the use of natural gas to generate electricity is drawing a significant amount of current attention. Some question whether natural gas should be the fuel of choice in most of the new electrical generation capacity. Some have proposed that new natural gas electricity generation capacity be prohibited. Few seem to recognize that the driving force behind these investments are the national environmental policies that value the clean burning benefits of natural gas. Fewer still suggest what alternative energy sources would provide the new electricity that is needed while maintaining these environmental standards. And unfortunately, only a tiny number recognize that the new gas fired electricity generating facilities are 40 to 50 percent more efficient than existing gas fired capacity which allows the same amount of electricity to be generated with roughly half the volume of natural gas.

Policymakers need to clearly understand the nature of the natural gas industry before rushing to judgments on limiting its use. Far better solutions are available through encouragement of conservation and sound expansion of supply.

THE SUPPLY CHALLENGE—IT WAS FORESEEABLE; IT WAS FOREWARNED

Initially, it is important to put the current supply and demand situation in some perspective. The United States will remain principally dependent on oil and natural gas for the foreseeable future to meet its energy demands. Recent projections by the Energy Information Administration (EIA) show the oil and natural gas will provide for about 65 percent of domestic energy over the next several decades.

Second, it is essential to recognize that current natural gas prices and supply constraints are the consequences of past decisions. More importantly, they are the result of failures to respond to clear forewarnings that action needed to be taken.

Back in 1999, when the National Petroleum Council (NPC) transmitted its *Natural Gas* study, it concluded:

> The estimated natural gas resource base is adequate to meet this increasing demand for many decades . . . However, realizing the full potential for natural gas use in the United States will require focus and action on certain critical factors.

It was a clear signal that action needed to be taken. Moreover, it was a call that was echoed by those in the industry that have sought greater access to the national resource base. IPAA was one of those many voices. Looking back at testimony IPAA has presented both before and after the NPC study, there has been a clear and increasingly urgent call for changes to national policies.

For example, in January 1999, Steve Layton testifying before this Committee about the damage being done to the domestic oil and natural gas industry from the low oil prices of 1998-99 described the consequences to domestic natural gas production as follows:

> Without this infrastructure it is not only the nation's oil industry at risk but its future natural gas use as well. This country has a vision of building a future on expanded use of clean burning natural gas. The industry has been challenged to increase natural gas production by about 40 percent—that is a net increase of 40 percent. It will require production not only for that increase but to replace supplies that are depleted during the same timeframe. It cannot happen without a healthy oil industry. Oil and gas are found together. They rely on the same tools, the same science, the same skills, the same financial resources.

In June 2000, Jerry Jordan testifying before this Committee described the increasing importance of natural gas in domestic energy supply:

> 1. Natural gas is an increasingly important element of domestic energy supply. The National Petroleum Council *Natural Gas* study concluded that domestic natural gas demand will increase from the current 22 trillion cubic feet per year (Tcf/yr) to 29 Tcf/yr by 2010. Most of this increase will be needed to fuel expanding electricity generation. The study concluded that:
>
> > U.S. gas demand will be filled with U.S. production, along with increasing volumes from Canada and a small, but growing, contribution from liquefied natural gas (LNG) imports. . . . Two regions deepwater Gulf of Mexico and the Rockies will contribute most significantly to the new supply. . . . U.S. production is projected to increase from 19 TCF in 1998 to 25 TCF in 2010, and could approach 27 TCF in 2015. Deeper wells, deeper water, and nonconventional sources will be key to future supply.
>
> Importantly, this study concludes that these future natural gas needs can be met through domestic resources supplemented by other North American resources, but only if conditions are met.

He then described the critical need to address access to the national resource base:

> For example, we cannot expect to meet our nation's needs for clean burning natural gas without reasonable access to the resource. The NPC *Natural Gas* study and all other analyses conclude that the Rockies contain significant extractable reserves of natural gas. Yet, in the Rockies access is being limited. It is either the unanticipated outcome of laws, regulations, and plans that unintentionally deny access or the manipulation of these laws to produce that outcome. In either case, access limitations are not the result of a clear policy decision. Consequently, we need a commitment from Congress and the Administration that these types of constraints will be eliminated or restrained and proper funding will be provided on a continued basis to allow environmental documents, leases, and drilling permits to be issued in a timely fashion.

Earlier this year, Diemer True testifying before the House Committee on Resources summarized the dynamics of the past several years on natural gas supply in 2003:

> Going back to year-end 2000, we briefly saw the results of natural gas supply shortages. As storage dwindled, prices soared and consumers had to deal with the consequences. The initial phase of that supply-demand imbalance reflected the effects of low gas prices and unusually low oil prices in 1998-99 on capital availability to develop domestic natural gas supply. These historically low petroleum prices resulted in capital expenditure budget cuts for domestic producers exceeding 30 percent in 1999. The natural gas drilling rig count dropped by over 40 percent at its lowest point. In 1999, new wells failed to replace existing reserves.
>
> The petroleum price recovery and the industry's recognition that future natural gas demand would increase led by more and more electricity generated by gas powered turbines triggered a robust rebound in drilling for natural gas. Rig counts went to record levels. But, the lag in new production caused by the low petroleum prices left a tight market by the end of 2000. Higher prices resulted in more drilling rigs searching for natural gas, but production still declined. U.S. natural gas production today is lower than it was five years ago.
>
> The higher prices also reduced short-term demand. In reality, the abatement of high natural gas prices resulted from significant demand decreases not from supply increases.
>
> In the latter months of the 2001, prices had fallen to levels comparable to the first part of 1999 and rig counts began to fall as well. By year-end 2001 rig counts had fallen to April 2000 levels. While rig counts rose to around 700, they were well below the 1000 rate that was achieved in the fall of 2001. The implication of these lower rig counts was clear—supply levels would not be sustainable.
>
> Now, in early 2003, the implication has become reality. Natural gas supplies have been stressed by a cold winter and natural gas prices are in the range of $6.00 per thousand cubic feet. Natural gas drilling rig counts are in the range of 750. Estimates suggest that domestic natural gas production fell by around 2.8 percent in 2002. Clearly, the challenge facing natural gas producers is twofold—maintaining existing natural gas supply and increasing that supply to meet future demand. Access to federal resources play a significant role in meeting this challenge as well as barriers to development, which also adversely affects production. This remains complicated and new events suggest a worsening situation.

Since that testimony, prices have continued at high levels as winter demand drew down natural gas storage levels. Storage is now being replenished with an expectation that it might reach normal levels before next winter depending on summer demand. However, the continuing high prices have put pressure on demand, particularly in the process gas user component of the industry. Meanwhile, producers are responding with increased drilling activity. Drilling rig counts are 25 percent higher than they were at the beginning of 2003. Nevertheless, natural gas that is found today can take from 3 to 18 months to reach the market depending on where it is found and what infrastructure exists to get it to the market.

MANAGING THE SHORT-TERM; LEARNING FROM THE PAST

Over the long-term, meeting domestic natural gas demand will require a diversity of supply sources. The current challenge is to determine what options make the most sense to meet short-term needs and how to alter policies to produce better results in the future. Most frequently, there are four options that draw the greatest attention:

- Demand reduction;
- Increased use of Liquefied Natural Gas (LNG);
- Development of Arctic natural gas;
- Improvements in the development of lower-48 and offshore natural gas.

It is appropriate, then, to examine each of these.

In the short-term, demand alterations will be the only realistic option if the market remains as tight as it has been. IPAA believes that attention should be directed toward conservation measures that can be implemented in the short-term to reduce the pressure that has occurred in the market and has probably had its greatest effect on the process gas users. This component of the natural gas marketplace is an important element of the nation's manufacturing infrastructure. Because it largely competes in the international marketplace, it is more susceptible to price shifts and

has shown in the past that it can exit the United States if forced to that choice. In the 2000 2001 period of high natural gas prices, shifts in demand—particularly in the fertilizer industry were significant factors in the market that ultimately led to lower prices. Unfortunately, the dramatic shift that occurred also had the effect of reducing investment in new supply.

While LNG must grow to be a larger component of the natural gas supply mix, it is not the panacea that some analysts have seemed to consider it. First, it will take several years for the necessary investments to be made and for permitting of facilities to take place before significant growth in its share of the market will occur. Second, these investments will only occur if the natural gas price justifies them. A precipitous drop in price like that of 2001 would chill interest in LNG. Regardless, a major impact in supply from imported LNG is years away. Moreover, the experience of stumbling into the current structure of crude oil imports—with all the reliance on unstable sources that it entails—should trigger wariness in policymakers about how reliance on foreign sources of natural gas should be handled.

Although there has been significant interest in the development of Arctic natural gas, both Alaskan and Canadian, and the pipeline options to deliver it to the lower-48 states, all the estimates of its development predict that additional Canadian natural gas will not be available for another 4 to 5 years and Alaskan natural gas will not be a factor until the next decade.

Consequently, expanding domestic supplies inevitably requires better development of the resources in the lower-48 states and the federal offshore.

While analyses like the 1999 National Petroleum Council *Natural Gas* study and the newly released EPCA study by the Bureau of Land Management have focused on the resources that need to be developed to meet future demand—particularly with regard to federal lands—the challenge of maintaining existing supply has not received the attention it deserves.

The first and perhaps most compelling challenge to maintaining existing supply is coping with increasing rates of depletion. Conventional natural gas wells begin to deplete as soon as they begin to produce. But over the past decade, producers have seen average depletion rates climb from 16 percent per year to 28 percent per year. In somewhat simplified terms, this means that producers must initiate new production essentially equivalent to the current annual production from the Western and Central Gulf of Mexico each year just to stay even. New technologies like 3-D seismic enable explorationists to find smaller reservoirs. Enhanced production technologies like horizontal drilling are allowing better and more environmentally effective development of reserves. But finding smaller reserves and producing them more effectively makes the challenge of maintaining existing natural gas supply more difficult.

Second, it is important to understand the extent of development of the existing resource base. Some opponents of accessing additional federal lands suggest that the current resource base should be the first focus. In reality, it already is. Developing the current resource base for both conventional and unconventional natural gas is the source of existing supply. When the rig count grew to 1000, this is where it had to grow. But this resource base has supplied natural gas for the past 50 plus years. These mature reserves are harder and more costly to develop. New reserves in these areas are smaller and deplete faster or are deeper and more costly to develop. But, there is no doubt that these resources will continue to be developed as quickly as access is provided, natural gas prices justify development and capital is available to do so.

Policymakers need to understand these implications clearly. These are the conditions that are defining the current supply and demand balance. Not only must they be addressed, but the industry must also be capable of increasing natural gas supply to meet future increased demand.

Natural gas consumption is expected to grow by almost 50 percent by 2025. While recent events may have slowed the pace of this growth—an issue that is being assessed again by the National Petroleum Council—future natural gas consumption will likely grow at a pace that will require an energy policy that allows the full potential of natural gas to be developed. This cannot be done without more access to, and development of, government-controlled resources. However, development of these resources remains a substantial challenge.

OFFSHORE—WESTERN AND CENTRAL GULF OF MEXICO

These portions of the Gulf of Mexico have proven to be a world-class area for natural gas as well as petroleum production, accounting for over 25 percent of domestic natural gas production. Production comes from the continental shelf, the deepwater, and the emerging ultra-deepwater. The NPC study projects that future production

increases in these areas is essential to meet projected demand. However, future production increases will hinge on federal offshore policies. The most significant of these in the Western and Central Gulf of Mexico relate to royalty policies. However, improvements to coastal zone management review policies could also help avoid costly delays in developing new supplies.

Legislation reported by this committee includes a number of provisions designed to enhance exploration and production in this offshore region. These include:

- Provisions for royalty incentives in the Western and Central Gulf of Mexico. It should parallel and extend the relief now being provided administratively in recent lease sales—those occurring after the House passed its bill.
- Provisions to address deep drilling for natural gas on existing leases.
- Provisions to create additional authority to develop RIK programs that will allow for more effective use of the highly desirable approach. RIK eliminates the complexities of determining the royalty value thereby saving both the government and the producer from the convoluted determinations that are now necessary and are frequently questioned—sometimes years after the sales occur. Offshore production is particularly suited for royalty-in-kind (RIK)—paying the royalty with production instead of dollars. It is a more economical and fairer approach. Recent actions to fill the Strategic Petroleum Reserve could utilize 80 percent of this offshore royalty oil. RIK should be encouraged for natural gas.
- Provisions for royalty relief for marginal wells on both federal onshore and offshore properties for both oil and natural gas. This relief encourages the continued production of these wells in times of low oil and/or natural gas prices. Retaining production from these wells is in the national interest and the provision should be included in the final bill.

OFFSHORE—EASTERN GULF OF MEXICO, ATLANTIC OCEAN, AND CALIFORNIA

Developing the substantial domestic natural gas resources in most of these three areas is prohibited by moratoria. President Clinton extended these moratoria for another ten years in 1998 saying, "First, it is clear we must save these shores from oil drilling." This is a flawed argument ignoring the state of current technology; it results in these moratoria preventing natural gas development as well as oil. In fact, both the Eastern Gulf and the Atlantic resources are viewed as gas resource areas, not oil—those coasts are not at environmental risk. Too often, these policies are predicated on the events that occurred 30 years ago. For example, no Eastern Gulf of Mexico sale occurred from 1988 to 2001. The recent sale took place only under greatly reduced conditions.

However, this year another ominous step was taken when the federal government decided to purchase leases that have not been developed, primarily due to regulatory limitations, in the Eastern Gulf of Mexico. This action led to calls for similar purchases off the coast of California and on other government controlled land. While the merits of each case should be reviewed, following such a course also serves to limit the available resource base at a time when it needs to be expanded.

Federal policy needs to be reconsidered. It needs to be based on a sound understanding of today's technology. When the NPC analyzed natural gas resources that were being inhibited by regulation of these areas, it concluded that over 70 trillion cubic feet of natural gas in these areas are precluded from development. Unfortunately, as soon as any discussion of offshore development begins, a barrage of reaction occurs claiming that any such discussion threatens the resort based economies of those coastal states—a consequence that has failed to occur in those states where offshore development exists and resort economies also thrive. IPAA commends the Senate for rejecting a recent amendment that would have eliminated a provision in the current Senate bill that authorizes an inventory of offshore energy resources.

ONSHORE RESTRICTIONS—A MOSAIC OF REGULATIONS AND PROHIBITIONS

Much of the onshore natural gas resource base is located in the Intermountain West. Yet, much of this resource base is constrained. And, it is clear that this area is a critical battleground between those who seek to develop domestic natural gas and those who seek to prevent development. Not only must energy producers navigate through a mosaic of regulatory constraints, producers must now deal with a series of strategic efforts to delay and prevent the necessary use of these national resources.

The regulatory framework to obtain permits to develop energy resources on federal lands is layered with complex and sometimes conflicting requirements. Federal Land Managers must operate through Resource Management Plans (RMPs) that require extensive Environmental Impact Statements (EISs). These address a wide variety of impacts regarding the use of the land. Formulating these RMPs and EISs

requires consultation and, in some cases, concurrence with other federal agencies and the states. These agencies, such as the U.S. Fish and Wildlife Service, are tasked with implementing laws, like the Endangered Species Act (ESA), that do not consider the balance needed between their wildlife management objectives and national energy needs. Yet, the Federal Land Manager is developing a plan in most cases for multiple use federal lands.

This process creates delay, confusion, and conflict. It produces a series of access and development limitations. Collectively, the effects are significant. The NPC's *Natural Gas* study estimated that access to 137 trillion cubic feet of natural gas in the Intermountain West was limited by regulation. Taking a different approach, the Bureau of Land Management (BLM) released its EPCA access report and reached a conclusion that roughly 40 percent of the natural gas resources in the federal lands it studied was restricted. Moreover, these studies were largely focused on constraints that exist at the leasing phase of the process. Even in those areas where the EPCA study suggests that there are no stipulations, that assessment applies only at the leasing level. When Applications for Permits to Drill (APDs) are sought, stipulations can still be required. Such stipulations can be extensive. For example, at one southwestern Wyoming site that was analyzed, stipulations effectively limit operations to only about six weeks per year.

There are no simple answers to this issue or a single solution that will address the problems. What is required is a commitment to develop these access policies with a full recognition of the importance of developing the natural gas resource. The National Energy Policy recognized the magnitude of these limitations. Executive Orders to consider energy supply implications in federal decision making and to convene a task force to improve permitting are important first steps in developing a response. These early efforts have resulted in specific tasks within various Executive Branch departments that should improve the permitting process.

Adequate agency funding and staffing is needed at the key field offices responsible for permitting and it needs to be directed toward the permitting process. Lack of funding has limited the ability of the agencies to permit, to monitor permits, and to enforce permit requirements leading to consequences that encourage conflicts between the different users of federal land. It has resulting in shifting the federal responsibility for developing EISs and other National Environmental Policy Act (NEPA) requirements to private parties where it was never intended to reside.

But the direct permitting aspect of addressing these access issues is only one part of a much larger debate. Besides these issues, energy producers are also confronting broad and aggressive efforts to otherwise delay or prevent access—strategies of misdirection, of litigation, and of division. Congress needs to recognize these efforts for what they are and react accordingly.

Prior to the EPCA study, development opponents consistently used a strategy of misdirection. They alternated between suggesting that the issues of federal land access were related to opening national monuments or that 95 percent of the federal lands were open to permitting and there was no issue. The EPCA study has helped focus the debate on the real areas of concern federal lands available for multiple use and the restrictive lease stipulations that inhibit their use. But, even with this new information, it is likely that development opponents will try to minimize the very significant issues associated with land use stipulations.

It is equally clear that development opponents are undertaking an aggressive strategy of litigation to thwart access in the Intermountain West. When the EPCA study was released, the reaction was quick and certain:

> *"If you bid on a lease on public land, you can expect (environmental litigation)."*—Peter Morton, The Wilderness Society, Dow-Jones Newswires, January 21, 2003

The federal government is now confronted with litigation threats and actions at every step in its process. Litigation has been filed to prevent exploration activities designed to identify possible resources. Litigation is filed over granting permits, challenging existing RMPs and opposing revisions to EISs. The primary result of this litigation is delay and more delay—and no new energy supplies. Delay is a key component of the strategy. Energy producers must invest capital, must replace and expand their production. If opponents to development can forestall access, it forces producers to shift their investment elsewhere. The longer producers are delayed, the higher the likelihood that they will give up on an area. This is the ultimate objective of this strategy of litigation, but it is ultimately a strategy that costs the nation domestic natural gas and impacts our energy security.

The circumstances surrounding efforts to develop resources—particularly coal bed natural gas—in the Powder River Basin of Wyoming and Montana demonstrate the type and magnitude of these challenges. The events in this area have unfolded over

the past two decades and present a characteristic pattern of the problems confronting natural gas development in the Intermountain West. The following is a rough chronological review of the events in the Powder River Basin.

TIMELINE FOR POWDER RIVER BASIN (PRB) OIL AND GAS ENVIRONMENTAL IMPACT STATEMENT (EIS)

1985 & 1986—Buffalo & Platte River Resource Management Plans (RMPs) are approved. Neither of the plans specifically addresses coal bed natural gas drilling.
1992—1997 Buffalo RMP is revisited and evaluated. The evaluation results in determining that the RMP planning and management decisions are still valid.
Throughout 1990's—Environmental analyses are conducted on a variety of coal bed natural gas project proposals in compliance with NEPA. Each of the analyses covered the effects of the proposed actions and alternatives, including the cumulative effects of the projects combined with other development and actions within the area. Based on these analyses, it was determined that amendments to the Buffalo RMP were not necessary.
March 1998—BLM begins an EIS to analyze the development of 3,000 to 5,000 coal bed natural gas wells in the Wyodak project area of the Powder River Basin. During development of the EIS, coal bed natural gas drilling on state and private lands increases dramatically in the PRB.
May & June 2000—BLM announces its intent to conduct an environmental impact analysis of oil and gas development in the PRB. Notice of Intent to prepare an EIS published in the Federal Register on June 21, 2000.
August 2000—BLM determines that levels of development approved in the Record of Decision, analyzed in the Wyodak EIS, have been reached. BLM will no longer approve Applications for Permits to Drill (APDs) for coal bed natural gas wells on federal lands and/or minerals within the PRB. BLM essentially places an embargo on new coal bed natural gas development on federal lands in the PRB. Coal bed natural gas projects on state and private lands are allowed to proceed.
January 2002—Draft EISs (DEIS) issued for coal bed natural gas development in the PRB in Wyoming and in the entire State of Montana.
May 2002—Public comment period on the DEIS closed. Over 17,000 comment letters were received on the two documents. US EPA Region 8 Office questions the validity of the DEIS.
January 2003—Final EISs issued for coal bed natural gas development in the PRB and the State of Montana. One month protest period announced for both documents.
April 30, 2003—Record of Decision (ROD) regarding oil and natural gas development in the PRB and Montana issued by the BLM. The ROD will allow up to 51,000 coal bed natural gas wells to be drilled in the entire region.
May 1, 2003—Coalition of environmental groups and landowners file suit in Montana to block implementation of the ROD.
Present—Suit attempting to block implementation of ROD pending in the courts. No stay preventing approval of APDs has been granted.

The history of the Powder River Basin EIS process presents two particularly perplexing issues. The first occurred when the EPA Region 8 Office raised objections to the DEIS after it had been under development for several years. This raises serious questions regarding the procedures used by the federal government in addressing energy permitting. The second issue is now unfolding. Clearly, there is a strategy of litigation being pursued to prevent development of the federal resource base in the Powder River Basin. However, while the tactic is clear, the courts have not succumbed to the strategy by issuing a stay of permitting. Nevertheless, a large backlog of APDs exists at the BLM and there appears to be no movement to expedite approval of these APDs. It appears that the BLM is self-imposing a stay on permitting.

The pending Senate legislation includes provisions to address the first of these issues. A pilot program is included that would enhance the coordination between the various federal agencies in the most active field offices. The intent of these provisions is to avoid future situations where one federal agency prevents another federal agency from carrying out its energy leasing and permitting activities because it was not involved in the EIS process early in its development. This approach offers the potential for improved federal agency interactions. Similar efforts are being developed by the administration's energy permit streamlining task force.

However, these efforts only address the leasing and permitting process from the federal agency perspective. The larger question that the Congress and the administration must consider is whether more direct efforts are necessary to either compel or allow action in the face of the strategies that are being used to prevent development of the federal resource base. Other proposals have been suggested to force

timely agency action. In the past proposals have been developed based on peril points where conditions are so critical that the President would be authorized to alter procedural requirements while maintaining substantive environmental protections.

Congress has an opportunity to address these other limitations. It can provide an improved process to assure that environmentally sound natural gas development can occur. If Congress believes that the current natural gas market situation—high prices, concerns over adequate natural gas supply—warrants more aggressive approaches to the leasing and permitting processes on federal lands, it has the power to create such processes.

Thank you for the opportunity to provide this perspective on the challenges facing natural gas production in the United States.

The CHAIRMAN. Thank you very much.

Senator Akaka, do you have any questions or observations?

Senator AKAKA. Yes, thank you very much, Mr. Chairman. I appreciate you holding this hearing on natural gas prices, production, and its challenges in the future. My questions concern liquefied natural gas as a fuel for the future, the long-term perspective. I would like to ask just two questions, Mr. Chairman.

The CHAIRMAN. Please.

Senator AKAKA. Mr. Grant, the challenges for increasing the use of natural gas and LNG are very, very important for the Nation and particularly for Hawaii. During my years in Congress I have continued to focus on energy sources for the future and opportunities for Hawaii to reduce dependence on petroleum. Just as in agriculture, depending on only one crop, or one source of energy, is a recipe for price spikes or economic disaster, or both.

As you probably know, in Hawaii we depend on petroleum for over 90 percent of our energy needs. We are a relatively small market with relatively high delivery costs and we are isolated from other States on the continent.

LNG provides the advantage of mobility without pipelines. LNG, however, requires an extensive infrastructure that Hawaii does not have. I am concerned about how Hawaii will participate in the opportunity to move toward LNG. Under what conditions will Hawaii attract the capital for investments in the necessary infrastructure for LNG?

Mr. GRANT. Thank you for the question. I think it comes down to, if you look at the recent expansion that we did in our plant in Everett near Boston, Massachusetts, you look for an anchor tenant. In this case it was a powerplant, and it allowed us to expand our facility. It gave that powerplant the flexibility that LNG facilities have, which is to go from zero to 100 almost instantaneously; the ability for, as the powerplants go up and down we can match those type of things. There is also some potential savings between hot and cold exchange type of things.

But that was the anchor tenant, and I think for Hawaii, particularly on the power side, our company is looking at expanding its LNG operations within the United States to a terminal in the Bahamas that would serve southern Florida. Again, it is based upon power growth similar to what the chart is there. Generally, LNG—and I think people have talked about it—has been a long-term supply and so you have both supply—you have got a supplier that likes that market and the infrastructure starts with something like a powerplant and then can expand from there.

Senator AKAKA. Thank you.

My final question is to my friend, David. As usual, it is good to see you here. I am pleased to see the Department's investment in energy efficiency and renewable resources are in good hands.

Mr. GARMAN. Thank you, Senator.

Senator AKAKA. As Chairman Greenspan has noted, significant global trade in LNG is developing. But Hawaii may find it difficult to attract capital investment in LNG. When the market does not work, I believe there is a role for the Federal Government to create a more level playing field by providing opportunities to reduce the Nation's dependence on foreign oil.

There are precedents for Federal financial assistance to States to overcome their unique difficulties, and the Nation's challenges in building infrastructure for the development of new technologies, and it may be necessary to provide economic incentives to attract the infrastructure necessary to participate in the conversion to natural gas.

Are there models of public-private partnerships that you can suggest which could include the role of the Department of Energy to assist States to meet this goal?

Mr. GARMAN. I am not aware of any program that we have at the Department or elsewhere that would provide assistance with direct capital contributions to infrastructure development in Hawaii. We do of course have a State energy program run in my office, around $40 million a year, where we provide grants to States to help them understand how they can employ new technologies that fit the needs of those States. We work very closely with Maurice Kaya, of Hawaii of the State energy office. I will be happy to engage Maurice and others in the Department to see if there is something I might not be aware of beyond the State energy program.

Senator AKAKA. Thank you very much.

Thank you, Mr. Chairman.

The CHAIRMAN. Thank you very much.

Senator, I have one question, then I will yield to you. I have just this question. It is my understanding that the Department—this is for Bruce, Mr. Thompson—that on April 30 the Department of the Interior completed all the appropriate environmental reviews to allow new coalbed methane production in the Powder River Basin. However, there are over 2,000 drilling applications awaiting departmental approval.

Can you explain to me why, in the midst of this natural gas crisis, the Department has waited nearly 3 months and still has not approved a single permit?

The follow-on would be something that you should not be surprised to find in the bill as an amendment: Would you support legislation that would require that the Federal land managers respond to permits within 45 days time period in order to prevent unnecessary and bureaucratic delays? Would this help improve the investment climate and the ability to raise capital for that area of exploration and development?

Mr. THOMPSON. Senator, it would clearly, something like that would clearly help raise capital. Anything that reduces uncertainty increases the ability to bring capital to an industry.

To answer the first part of your question, I have no idea why there are 2,000 permits still pending when the EIS, the record of decision is done and we should be up and moving. It is a function, I think—there is a lack of funding in some of these offices, that is part of it. There is also the tendency not to move when there is a threat of litigation hanging over people's heads. People do not want to make decisions that are second-guessed. That is a problem.

It is critical for our industry that we access this resource base. We need to be able to deal with things like this. This is a critical situation we find ourselves in and a speedier permitting process, however it is mandated, is one that we would be in favor of.

The CHAIRMAN. We are going to do our share.

Senator Craig, what always happens is we find these areas and then the answers generally are: Well, we ran out of money, or OMB did not give us enough last year. Well, we have got to start picking some of these where it is quite obvious that there is no excuse of that type.

Mr. THOMPSON. We have some information we would be able to provide and help out on that.

Senator CRAIG [presiding]. Well, let me thank all of you. I have got a couple of questions and then I think we will have this hearing concluded.

Secretary Garman, you have heard, I think Mr. Ferguson talked about increased efficiencies and efforts that have gone under way in the gasification of coal. Mr. Thompson mentioned a priority list of things that can be done in the immediate sense, and the top of that was conservation. There is certainly no disagreement that movements in the area of efficiencies and conservation are a no-regrets kind of policy in the near term that all of us agree to.

The question is, how much low-hanging fruit is left out there that is going to affect in any way the bottom line of that spike or the top line of that spike, if you will? Could you speak to that? Has the Department looked at that? I know that high-priced markets oftentimes bring efficiencies that otherwise some did not think were there, although capital markets today and competition has brought a great deal of that. How much is left?

Mr. GARMAN. We think that in certain areas there is a significant amount of low-hanging fruit still available. I think your point is well taken, though. If memory serves, residential consumers of natural gas over the last decade or so have become more efficient by 22 percent as a consequence of new appliances, new windows, tighter building envelopes, and a variety of things that builders are putting into homes.

That does not mean that tremendous other opportunities do not exist. They do come at a cost. For example, all of us have things we can do to our homes, ranging from low-cost items like compact fluorescent light bulbs to high-cost items such as new windows or new cladding for the home, that could produce tremendous energy savings. The question is: is it cost efficient to do so and will that consumer do that based on the capital cost of the improvements that need to be made?

We in the Federal Government, owners as we are of 500,000 buildings, are learning this. In the Department of Energy, I believe we have lowered our energy use in the Department against the

1985 baseline by over 40 percent. But you are correct, it is getting harder and harder to find new opportunities to achieve additional savings, and that is the nature of the beast.

Senator CRAIG. Well, I know that we have been at this for some time and I am sure there are others out there. But I do not think any of us can anticipate in an ever-increasing demand curve in our markets that conservation gets us there. It is nice to see that "other" margin on that chart over there growing, but the reality is—and I think this committee has recognized it, as most of you do or all of you do, and our work product that will be on the floor the last of July demonstrates it. It is a very balanced approach. We have incentivized more conservation. We have incentivized renewable technologies. But we have recognized the raw and clearly understandable need to produce in all segments of the portfolio.

Mr. Grant, there is one thing that has been brought up consistently about LNG facilities since September 11, and that is of course their safety, the ability to site them. We have seen a considerable desire to shut down or expression of a desire to shut down an LNG facility in Maryland because of its proximities and all of that.

Could you comment on the issue of safety, target hardening if you will—or maybe I should not use that phrase—facility hardening, as it relates to the security of the operation of these so that they would be less inclined to be a potential target?

Mr. GRANT. Thank you for the question. Actually, it has been referred to in our area as "target hardening."

Senator CRAIG. It really has? Well, all right. Well then, we will use that.

Mr. GRANT. I have addressed a little bit of that in my testimony. But it is one of those things where you do not have to take my word or our company's word for it. The history safety and security-wise of the LNG industry is almost unprecedented. These ships are very sturdily built. As a company we have taken safety and security very, very seriously, when you look at the things the Department of Energy has done, Department of Transportation has done around these things.

I think the biggest issue that we have is an education issue. When you look at Japan and Korea, who are almost 100 percent dependent on LNG for their natural gas usage, when you look at Spain, who takes over half of their gas in the form of LNG into that country, it is a very normal part of their infrastructure.

Except for New England, LNG is seen as something very kind of unique here.

Senator CRAIG. Yes.

Mr. GRANT. They forget that it is basically just another way to bring natural gas here. The ship is a surrogate for the pipeline. I think when you get past that—the way that these things are constructed, the ships are all double-hulled. You have seen a lot of things in oil about everything should be double-hulled. They have always been. The ships are—it is not under pressure.

We have done a number of things over the years working with the Coast Guard, working with the Department of Energy, Department of Transportation, that preceded 9-11, just to make sure that the security and the safety of these ships—the standards have al-

ways been there, and the industry believes very strongly in safety and security.

But I think the number one thing is education, getting the record out there, getting the experts like Lloyd's to talk about it. The Department of Energy has got a number of experts as well, in addition to industry officials. But it is something we take as an industry very, very seriously. But again, we believe it is an educational issue around the product because of how unique it is perceived in the United States.

Senator CRAIG. So I think I am understanding from you that if you look at all energy sources as a potential target, this is no more or less dangerous than any other that is out there?

Mr. GRANT. Yes, and we would believe—yes is the first answer. We also believe, because of the construction both of the tanks and of the ships, and also the security measures—I mean, our company has spent $3.5 million more on security post-9/11 to make sure that we do harden the target. We have got—you probably know that Boston is considered a model port right now—the cooperation that we have done with the Coast Guard and the people in those areas.

We think that is a very important part of doing business and it is something we are committed to, to working with the government and local people to do.

Senator CRAIG. How realistic—Chairman Greenspan spoke briefly about offshore locating these kinds of facilities. How reasonable is that and is that technology being looked at?

Mr. GRANT. The technology is being pursued right now. I think that there are opportunities both onshore and offshore. One of the issues with offshore, if you are talking about—and I think the chairman mentioned regasification ships is you literally have to have the ship parked there while it is vaporizing the gas, which means you have got an infrastructure that is out there. Logistics are a very big part of our business. The production drives the shipping, which drives the market. They do not like to shut down a billion dollar liquefaction plant because the market will not absorb the product, and that is the way it is built.

Can that be a supplement? Yes. Is that the answer by itself? No, because I think as a country if we said that there is a technology available to move every oil import terminal offshore, every chemical plant offshore, every hazardous cargo of any kind offshore, of course we would like that. But it comes with a cost and it comes with a cost to the infrastructure.

Senator CRAIG. Well, gentlemen, thank you very much for your patience and your testimony before the committee. We are moving into a critical time frame here in the Senate, in which we have a window of opportunity to pass what I think and I think most committee members believe to be a significant piece of energy policy for our country.

If we can pass it in the Senate, we will have it on the President's desk for his signature by late year. I believe that can happen. Let me ask all of you to take time in your busy lives to visit with your industry and your industry CEO's—I do not often do this from the dais—to make the phone call to my colleagues here in the Senate, to encourage them to get with the business of passing this critical policy.

I really believe it is that important for our country and our country's future. We have done something that is bipartisan, that is balanced, that has as much conservation in it, it has phenomenal incentives, $17 billion worth of incentives in it, and it has production in it. You can help all of us in the next month by working this issue as hard as some of us will. And if you do and we do, it will become a reality, I do believe, and that chart will level out over there in time.

Gentlemen, thank you very much. The committee will stand adjourned.

[Pause.]

Senator CRAIG. Oh, yes, I am supposed to wrap up here. You are free to go.

I will reconvene the committee and I will remind members and staff that we will require members' statements and questions to be submitted for the record by the close of business today.

We are re-readjourned.

[Whereupon, at 1:17 p.m., the hearing was adjourned.]

APPENDIXES

APPENDIX I

Responses to Additional Questions

[Note: Responses to the following questions were not received at the time this hearing went to press.]

RESPONSES OF DAVID K. GARMAN TO QUESTIONS FROM SENATOR BINGAMAN

Question 1. Yesterday the Department kicked off a "Smart Energy Use" Education Campaign. I understand that it involves a new website and several regional meetings. Can you describe this strategy in more detail? How much money has been dedicated to this effort? Do you have specific goals in mind for saving energy? How will the states participate in this effort?

Question 2. I am concerned that the DOE outreach programs that can have the most impact on natural gas and electricity demand may be underfunded in light of this emerging crisis and your plans to deal with it.

For example, your testimony highlights the programs under the Office of Industrial Technology and their success in reducing gas demand. At the Natural Gas Summit your industrial "best practices" program was highly praised. Can you explain why the President's request for FY 2004 decreased the Industrial program from $91.4 million to $64.4 million or a 32% cut?

Similarly, you have reduced what you call "Gateway Deployment" programs by 33%. These are the outreach and technical assistance programs like Energy Star, building codes training and energy efficiency information. Are you planning to reprogram additional funds in order to support the Smart Energy Campaign? Will DOE seek supplemental appropriations, or reallocate funds internally, to support a national campaign and boost support for key deployment programs such as Energy Star and industrial programs?

Question 3. What is the Department doing to accelerate energy efficiency standards that can save natural gas, including residential heating equipment and commercial air conditioning?

Question 4. Are you focusing on electric efficiency to save gas, starting this summer, since so much of our summer peak electricity generation comes from natural gas? What can be done to encourage utilities to dispatch their most efficient units rather than older inefficient gas plants?

Question 5. For longer term gas savings in the power sector, combined heat and power systems are at least twice as efficient as average powerplants. What is DOE doing to significantly expand its CHP Challenge program?

RESPONSES OF BRIAN FERGUSON TO QUESTIONS FROM SENATOR BINGAMAN

Question 1. In addition to coal gasification technology, do you support increasing the amount of electricity that is produced by wind, solar and other renewable forms of energy in order to reduce the pressure on gas supplies?

Question 2. In addition to supporting coal gasification technology, is there anything the Department of Energy could be doing in the near term to assist industrial gas consumers to improve the efficiency of their operations and reduce or find alternatives to natural gas use?

Question 3. Has the Combined Heat & Power potential within the chemical industry been fully exploited? What are the barriers to increasing the use of CHP?

RESPONSES OF RICHARD L. GRANT TO QUESTIONS FROM SENATOR BINGAMAN

Question 1. In your testimony, you note that ". . . today LNG development is especially important for countries like Trinidad, Angola, and Nigeria. In these countries, most of the natural gas that is produced with crude oil is flared because there are few alternatives for usage or disposal of the excess gas."

The flaring of excess natural gas is a terrible waste of valuable energy resources. There are many places around the globe where the venting and flaring of natural gas continues but needs to be curtailed. What can we do to get the necessary attention devoted to these areas, to stop this wasteful practice? As you note, LNG projects in places like Nigeria seek to harness this resource. What were the keys to successful projects that you have worked on in these areas?

Question 2. Do you agree with EIA's projections for the expansion of LNG import capacity in the U.S. (about 11% increase per year)? What are the major challenges from a project development perspective—including all of the required investment—production, liquefaction, shipping, and regasification?

Question 3. Does the LNG industry have any coordinated public education programs on LNG operations and safety?

Question 4. We have heard from the DOE that there are more than 30 applications active for LNG-based projects in the U.S., most beyond the permitting process. Some of these are facilities on offshore platforms. What do you think the future landscape for LNG terminals will look like? Are most of them going to by based offshore? What does this mean for the building of additional infrastructure and necessary environmental and safety precautions?

Question 5. In your testimony you mention that LNG technology is improving. What are you improving, and what does this mean for LNG economics, or essentially the cost to the consumer?

Question 6. Some have raised the issue that our growing dependence on imported LNG could be the beginning of a situation that could quickly resemble our dependence on OPEC for oil import. How do you view this? What nations do your cargoes come from? What does this mean to you as a terminal operator?

Question 7. In your testimony, you note Tractebel's pacesetter actions on public-private partnerships and safety. Specific reference is made to the Berge Boston, the first vessel in the world to meet the International Code for the security of ships. How long will it be before most LNG ships meet this code? Can they be retrofit? Are there deadlines in place?

RESPONSES TO QUESTIONS FROM SENATOR BUNNING

Question 1. Our nation has become extremely dependent on natural gas and with low levels of natural gas inventories its high prices are affecting our economy. This situation was foreseeable and will only get worse if we do not change the demand and supply ratio. Do you think that this country should begin relying more on other sources of energy such as cleaner burning coal to meet our energy needs rather than just on natural gas?

Question 2. Demand for natural gas should be reduced and promotion of conservation of energy is one good way to do this. What is the Department of Energy doing to encourage manufacturers to increase efficiency in their use of natural gas?

Question 3. We have not even begun to tap into all the natural gas supply that this country has. Much of our natural gas supply is off limits for production or development is severely restricted. Do you think that we should develop more areas in the United States to increase our natural gas supply?

RESPONSE OF ALAN GREENSPAN TO QUESTION FROM SENATOR KYL

Question. If Congress enacts multi-pollutant legislation or carbon dioxide regulation legislation that forces utilities to switch from coal to natural gas for electricity generation, what effect would it have on natural gas supply and markets?

RESPONSES OF ALAN GREENSPAN TO QUESTIONS FROM SENATOR FEINSTEIN

Question 1. Your testimony did not mention the fraud and manipulation that has pervaded our energy markets over the last few years. As I said before, the recent FERC report on Price Manipulation in the Western Markets states, "markets for natural gas and electricity in California are inextricably linked." Do you believe our regulators should have the ability to issue the same penalties and refunds in both sectors so that natural gas consumers are protected in a manner consistent with electric consumers?

Question 2. Let me take you through some other examples of fraud and manipulation in the natural gas sector and ask you about some specifics of the Energy bill now pending in the Senate.

On January 27, 2003, Michelle Marie Valencia, a 32-year-old former senior energy trader for Dynegy was arrested on charges that she reported fictitious natural gas transactions to an industry publication.

On December 5, 2002, Todd Geiger, a former vice president on the Canadian natural gas trading desk for El Paso Merchant Energy, was charged with wire fraud and filing a false report after allegedly telling a trade publication about the prices for 48 natural gas trades that he never made in an effort to boost prices and company profit.

CMS Energy, Williams, American Electric Power Company, and Dynegy have each acknowledged that its employees gave inaccurate price data to industry participants.

Fraud and manipulation extended beyond just false reporting.

Dynegy, Duke Energy, El Paso, Reliant Resources Inc., CMS Energy Corp., and Williams Cos. all admitted engaging in false "round-trip" or "wash trades."

Section 1172 of the Energy bill now pending in the Senate prohibits the filing of false information and prohibits round trip or wash trading in electricity markets. Shouldn't the Senate expand this provision to ban false reporting and wash trades in the natural gas markets?

Question 3. You mention that the long-term price for natural gas has risen persistently during the past six years from approximately $2 per million BTU to more than $4.50. How much of that increase do you attribute to market manipulation, especially when you consider that no transparency and no audit trail is required in off-exchange energy markets—where an overwhelming amount of natural gas trading takes place?

Question 4. This morning's *Washington Post* Business Section had an article describing how companies are pulling back from trading and a lack of liquidity is causing prices to increase in our natural gas markets. In the article, one analyst said having fewer traders in the market means there are fewer offers to buy and sell. Instead of rising in small steps, natural gas prices are jumping by bigger increments, according to analysts.

You signed a letter of June 11, 2003 to oppose the Energy Market Oversight Amendment I offered to the Energy Bill. I fail to understand your continued opposition to my legislation which, by the way, does not at all impact financial derivatives. In light of this recent pullback from trading, wouldn't increased oversight and transparency boost consumer and investor confidence in our troubled energy markets?

Question 5. By increasing energy efficiency quickly and dramatically in 2001, California prevented the severe electricity shortages that dogged the state throughout the previous summer from becoming worse. Savings were achieved through a combination of rules, incentives, and public education. Do you support similar efforts on the federal level and do you support new efficiency standards for gas furnaces, air conditioners, electrical transformers and other equipment that by some estimates could save nearly 10 trillion cubic feet (tcf) of natural gas over the next 20 years?

Question 6. In your testimony, you mention that industrial users are the leading consumers of natural gas. In addition to the chemical, aluminum, and fertilizer industries—the ethanol industry is also dependent on natural gas. Since most ethanol plants rely solely on natural gas, is this the time to mandate billions of gallons of ethanol into our fuel supply and force many more ethanol plants using natural gas to be built?

RESPONSES OF RICHARD K. GARMAN TO QUESTIONS FROM SENATOR FEINSTEIN

Question 1. Mr. Garman, by increasing energy efficiency quickly and dramatically in 2001, California prevented the severe electricity shortages that harmed the state throughout the previous summer from becoming worse. Savings were achieved through a combination of rules, incentives, and public education. What is the Department of Energy doing to enlist State and Local governments, as well as the industry, in conservation and efficiency efforts? What does Congress need to do?

Question 2. Mr. Garman, does the Bush Administration support new efficiency standards for gas furnaces, air conditioners, electrical transformers and other equipment that by some estimates could save nearly 10 trillion cubic feet (tcf) of natural gas over the next 20 years?

Question 3. Mr. Garman, what is the potential for increasing imports of LNG? What are the realistic expectations? And in what time frame? There are several projects under consideration in California and in Baja California south of the border. Are there any LNG projects in particular that you see more likely to come online than others?

APPENDIX II

Additional Material Submitted for the Record

STATEMENT OF THE NATIONAL PETROCHEMICAL & REFINERS ASSOCIATION

NPRA, the National Petrochemical & Refiners Association, is a national trade association whose members include virtually all U.S. refiners and petrochemical manufacturers. NPRA appreciates the interest of the Senate Energy and Natural Resources Committee in the vital issue of ensuring adequate supplies of natural gas to industrial consumers. NPRA believes that diverse, ample and affordable supplies of fossil fuels are essential to maintain U.S. national security, economic growth, and the viability of the domestic refining and petrochemical industries.

America's standard of living and overall economic health are closely linked to the need for an adequate supply of energy at reasonable prices. Our nation currently faces severe challenges as it strives to balance ever-increasing energy demands from all consuming sectors, largely due to contradictory and short-sighted policies that have limited supply while promoting additional natural gas consumption. These conflicting policies, either in the short or long term, are simply incompatible with continued U.S. economic growth.

NPRA also believes that there is an urgent need to harmonize the nation's energy and environmental policies, and that any national energy plan must include traditional supply and market-oriented policies for all fossil fuels, including natural gas.

BACKGROUND

Energy is a strategic commodity. Without it, either through insufficient supply, unreasonable cost (or both), any modern economy is at risk. The threat of shortages can cause significant price escalations and disruptions in the marketplace. In recent years, domestic demand for natural gas has substantially increased, while production has recently decreased. Our experience with high natural gas prices and short supplies last winter was a reality check for the nation's flawed policies, and we must act now to correct that situation. Government, industry, and private experts agree that natural gas demand is expected to rise by the year 2020 by as much as 60% over today's levels. It is still unclear whether domestic gas production can increase to satisfy this new demand.

This is really not a resource problem that we face. But, if changes are not made to existing policies, our predicament will not be short-lived. This means that policymakers and gas issue stakeholders must act or accept responsibility for the ultimate consequences of short supplies, lost U.S. jobs, a worsening trade balance and further loss of U.S. industrial leadership. There is no OPEC to blame for this natural gas supply crisis; the United States has an abundant supply of domestic gas. Flawed government policies have prohibited its development in many areas. Thus, the blame for insufficient U.S. natural gas supplies rests on our nation alone. NPRA believes the current ill-advised national policy of limiting natural gas supply while encouraging gas use because of its environmental benefits—mostly in the generation of base and peak load electricity—has created and could exacerbate continuing higher gas prices and volatility. In fact, EIA reports that demand by electricity generators is expected to account for 30% of total natural gas consumption in 2025. This equates to a doubling of gas use by the utility sector over current demand. Under present policies, it is not clear that adequate supplies will be available to accommodate this demand figure unless current natural gas users in core industries are forced to switch fuels or close.

The domestic petrochemical industry, as well as others in the basic chemical sector, is primarily based upon natural gas and natural gas liquids. About 70% of U.S. petrochemical manufacturers use natural gas liquids as feedstocks. In contrast, about 70% of petrochemical producers in Western Europe and Asia use naphtha (a heavy oil) as a feedstock. While oil is a global commodity whose price is set on the

global market, natural gas liquids are generally more locally traded commodities. Thus, price increases in natural gas have had a larger impact on competitiveness in North American-produced petrochemicals.

The U.S. has generally maintained a reasonable-cost feedstock position relative to its competitors in Europe and Asia. However, that situation has been eroded as the price of natural gas has increased. North American natural gas and natural gas liquids prices have recently risen to unprecedented levels and placed a significant portion of the domestic petrochemical industry at a disadvantage to European and Asian producers. The trend towards increased siting of base petrochemical production and expansion projects in overseas locations is directly attributable to this growing disparity in fuel prices. Additional displacements will occur if the current and prospective gas price and supply situation is not addressed promptly.

Chemical exports are usually significant contributors to U.S. trade receipts. Unfortunately, two years of extraordinarily high natural gas prices (2001-2002) have resulted in a depressed chemical export market and a negative trade balance for the U.S. economy. This negative trade balance allows foreign businesses to capture U.S. market share, in part because European and Asian producers are not experiencing similarly increased feedstock prices.

SHORT-TERM OUTLOOK: ENCOURAGE CONSERVATION AND EFFICIENCY, BUT INCREASE SUPPLY WHEREVER POSSIBLE

Industry analysts report that domestic natural gas production has declined by 6% over the last six quarters. In turn, utilization of natural gas by the electric utility industry has caused unprecedented demand, especially in the summer season where natural gas provides "peaking" power to many industrial and residential users.

Historically, the summer months have been periods to re-supply natural gas storage facilities in preparation for increased winter demand for gas for commercial use and residential home heating. The increased demand for natural gas during the past summers has placed additional constraints on storage, and the U.S. is now experiencing low levels of storage volumes—624 Bcf less than last year at this time and 348 Bcf below the 5-year average volumes for the end of June, according to the EIA. This is roughly 17 percent below the 5-year average for the report week, and more than 27 percent below the level last year for the same week. Under current conditions, it will take daily storage volumes of record proportions for the remainder of the summer season to return to storage levels entering the previous winter of 2002-2003. Although recent data indicate a larger than normal storage rate over the past few weeks, we should not be lulled into complacency because favorable weather patterns have led to what may be only a temporary increase in these daily gas storage levels.

In addition, gas injection rates are only one facet of the natural gas supply dilemma. Industry must deal with the manifold implications of a generally higher price level for natural gas, also accompanied by more price volatility. Both factors mean trouble for all consumers—industrial, commercial, residential—regardless of gas storage volumes.

Unfortunately, much must be accomplished on the supply side of this equation in what is a short, but nevertheless critical, time period. In essence, our nation's natural gas supply for the next 8-10 months may largely depend upon good weather and good luck this summer and next winter. We must try to improve things, but real possibilities of doing so are limited in the short term. In order to address this shortfall in supply meaningfully, we must hope that Congress and the Administration will act to provide greater supply and price certainty to natural gas markets in the mid and long-term. And this requires a change in current policy to put greater emphasis on supply.

In the immediate future, efforts should also be made to help mitigate the supply problem through voluntary conservation and efficiency efforts. NPRA urges both Congress and the Administration to act to improve energy efficiency and conservation in the use of natural gas and power, especially as the nation enters the summer cooling season. This could be accomplished by offering appropriate incentives. Any adjustment in electricity consumption would reduce natural gas consumption by the power sector and have a positive impact on natural gas availability. This, in turn, could help to moderate natural gas supply and price concerns. Further, if and when natural gas supplies become extremely tight this summer or early fall, the federal and local government should allow electric utilities and other industrial facilities to switch to alternative fuels in order to conserve natural gas supplies. Pre-emptive efforts to encourage fuel switching would be even more helpful.

LONGER-TERM OPTIONS: AVOID DISTRACTIONS; FOCUS ON SUPPLY

For all these excellent reasons, NPRA welcomes the Committee's review of the natural gas situation. We urge you to study and assess current policy thoroughly and openly. The nation needs a frank and public debate on the future of its gas supplies. As we earlier stated, natural gas demand is projected to increase by 60% by 2020. The President's National Energy Policy Task Force projects that over 1,300 new electric generating plants must be constructed to fulfill anticipated electric energy needs during the next 20 years. DOE suggests that over 90% of these facilities will be fueled by natural gas. This increase in gas usage for electric generation may not be achievable, and should be one subject of the Committee's investigation.

We must also develop policies that promote continued environmental progress without reducing the supply of natural gas and other petroleum products needed for a healthy economy and the nation's security. We need to forge a diversified national energy policy that reduces our dependence on foreign energy sources while increasing our domestic production. These policies must include increased access and development opportunities to onshore public lands as well as those on the Outer Continental Shelf. We must also bring Alaskan natural gas to lower 48 markets as soon as possible. New and promising domestic areas for development must be open for exploration and production. In the meantime, NPRA would urge caution when Congress and the Administration consider any policies, environmental or other, that will accelerate the demand for natural gas when other policy options exist.

Environmental progress and energy supply need not be mutually exclusive. However, long-standing and recent environmental policies have significantly limited fuel and energy supply choices. They have promoted or even required fuel switching while at the same time discouraging expanded domestic production of natural gas. Anticipated environmental constraints could aggravate the current situation. This is a formula guaranteed to make an already bad situation worse.

The National Petroleum Council (NPC), at the request of the Secretary of Energy, is currently developing recommendations and policy options on the long-term future of natural gas as one of the key elements of our nation's energy menu. NPRA is an active participant in this study and urges Congress to seriously consider any and all of the NPC's specific findings and recommended policy options.

RECOMMENDATIONS

NPRA urges Congress and the Administration to re-think and re-evaluate current and future policy initiatives. We should focus on all energy options, including fuel choice mixture and flexibility; gas supply source diversity; modernization, expansion and permitting of infrastructure, including LNG facilities and pipelines; development of new technologies; and natural gas market transparency and efficiency. As a nation, we can not afford to inhibit options that are beneficial to supply.

CONCLUSION

Natural gas and natural gas liquids function as primary feedstocks in domestic petrochemical plants and other industries. Their availability at a reasonable cost is essential to keep the U.S. petrochemical industry competitive in a worldwide marketplace. We hope that the Congress will recognize that increased demand for natural gas supplies will result in even tighter supplies, and that the cost of gas as a feedstock will continue to rise. Policymakers should also recognize that since natural gas is used as a fuel and an industrial feedstock, negative impacts to core U.S. businesses will result if natural gas demand increases but supplies remain tight.

Refineries are also significant users of natural gas to run their facilities. Many switched to natural gas use for this purpose at the urging of environmental authorities such as the EPA. The result is that natural gas supply and price have considerable impact on the output of the nation's petroleum products as well as on refining industry profitability. Remember that refiners face a tight supply/demand balance for petroleum products and limited profitability under normal circumstances.

Thus, any analysis of the current and projected natural gas supply and demand makes one thing very clear: we urgently need a thorough review of natural gas-related policies to maintain and retain the U.S. petrochemical and other manufacturing industries in the context of a healthy and growing U.S. economy. It is clear that natural gas will play an increasingly important role in America's energy future; but we must analyze, clarify, and correct policies to maximize the available supply of this key resource. Therefore, we repeat that the principal focus of the gas policy discussion must be on the need for increased supply.

For this reason, NPRA appreciates the Committee's efforts to investigate the issues surrounding and impacting the supply, demand, and price volatility of our

nation's natural gas resources. We hope to work with all stakeholders to design a natural gas policy that provides adequate supply at reasonable and predictable prices to fuel the U.S. economy and maintain growth.

STATEMENT OF M. JOHN KENNEDY, PRESIDENT, KENNEDY OIL, GILLETTE, WY

Mr. Chairman and Members of the Committee, thank you for the opportunity to submit this testimony. I am grateful you are holding this hearing on this important national issue and look forward to working with you and other Members of Congress to determine the best method to access our natural gas resources in an environmentally sound manner.

Kennedy Oil is a small, independent oil and gas producer located in Gillette, Wyoming. I am the owner of Kennedy Oil and employ 35 people in Wyoming. We currently operate 581 wells and produce approximately 12 bcf of natural gas annually.

As everyone on this Committee is aware, the United States will soon face a natural gas shortage that could result in dramatically higher prices for natural gas, negatively impacting consumers and the economy. U.S. gas production is decreasing at approximately 10% annually, existing wells are producing less gas, and fewer reserves are found per well. Although we currently import significant amounts of natural gas from Canada, Canadian production is decreasing as well.

The area of the country known as the Rocky Mountain region, holds nearly one third of U.S. proven gas reserves and is an easily accessible, proven way to supply the natural gas needed to fuel our economic growth. In fact, the Rockies is the only region that has shown an increase in production over the last three decades and is the only significant onshore supply growth area in the United States.

In Wyoming alone, with new technologies now available to produce gas from coal and from tight gas sands and shales, there is enough recoverable gas to contribute up to 25% of the natural gas our Nation needs. With natural gas consumption projected to be 30 tcf per day by 2010, Wyoming's recoverable reserves will supply the nation for the next 40-50 years.

However, these reserves are not being developed. The Powder River Basin, which contains Coal Bed Natural Gas (CBNG) recoverable reserves projected at 30 tcf, suffers from lack of pipeline take-away capacity. Producers are unable to commit to additional pipe out of Wyoming to areas in need of new gas supplies because of an inability to forecast with any degree of certainty when Federal drilling permits will be issued. This lack of take-away capacity has depressed the value of Wyoming gas. In the past 12 months the State of Wyoming received $280 million dollars less for its gas than the value it should have received, based on normal index pricing.

At the same time, the Federal government suffered a $90 million dollar shortfall in its royalty income from Wyoming gas, for the same reason. The Environmental Impact Statement (EIS) for the Powder River Basin was delayed two years longer than anticipated and permits are still not being issued due to various lawsuits objecting to the Record of Decision (ROD).

President Bush and Congress have given the order to move forward with the development of the enormous known natural gas reserves located on Federal rangelands in Wyoming and other parts of the Rockies. This natural gas is clean burning, easily developed, and is the centrally located fuel of choice. The development of these gas reserves will create wealth within this country, will create tens of thousands of new jobs, hold down consumer prices and save industrial jobs. Unfortunately, significant hurdles exist to accessing this natural gas.

Kennedy Oil is prepared to drill 250 new CBNG wells in the center of the Powder River Basin—we are only waiting for Federal drilling permits. At the same time, we have submitted Federal permit applications for a 20 well project in southwest Wyoming—which is the lead in for over 200 CBNG wells in the area. Kennedy Oil has been waiting for 22 months now for these 20 permits and we are still waiting. Winter is around the corner. High gas prices and low storage numbers are inevitable. Jobs will be lost and people will be unnecessarily penalized.

These lengthy delays and uncertainties create a difficult business environment. As you are aware, the Bureau of Land Management (BLM) is the agency responsible for administering the permits necessary to drill. Some field offices can be more responsive than others, and in some cases, it would appear that personal agendas can play a role in delaying particular projects. In addition, it appears that because of the great disparity in how permit applications are treated, some offices have significant resource problems.

For example, last week we called the BLM–Rock Springs Field Office (RSFO) (Wyoming) inquiring about a Right-of-Way (ROW) Application we had submitted in June 2002, 13 months ago. The ROW grant is needed to access a drillsite for a shal-

low gas well. The ROW applied for is for use of an existing, upgraded, gravel road on Federal surface. RSFO informed us that the ROW grant is held up for archaeological review. After talking to the BLM archaeologist in charge of doing cultural clearance on this ROW application we were told that he has 600+ like projects on his desk and to "get in line".

I believe that permitting could be expedited in a fair and environmentally sound manner if the State Offices had the authority to implement standard procedures and time lines to be implemented by each field office. Currently, the time limits keep shifting and requirements differ for every permit for which we apply.

The American economy and the American consumer continues to suffer the consequences of volatile gas prices and supplies. Industry is prepared to make the investment in exploration and development. Our nation needs the natural gas. Kennedy Oil believes congressional intervention is necessary to help alleviate the permit back log and avert the energy crisis that threatens this nation.

Thank you for the opportunity to submit this testimony and I look forward to working with Congress and the agencies to promote responsible, timely resource use policies.

STATEMENT OF THE EDISON ELECTRIC INSTITUTE

The Edison Electric Institute (EEI) and its Alliance of Energy Suppliers (Alliance) are pleased to submit this statement for the record of the Committee's July 10 oversight hearing on natural gas. EEI is the trade association of the U.S. shareholder-owned electric utilities and affiliates and associates worldwide. The Alliance is a division of EEI that focuses on the generation business and related wholesale issues in the supply of electricity.

EEI will address three main issues in this statement. First, generators use natural gas because it is a relatively clean, efficient, and cost-effective fuel, and gas-fired generators are easier and faster to build than other types. Second, federal policies should facilitate increasing the supply of natural gas and must provide greater certainty for the use of other fuels. These include provisions related to transmission siting and Clear Skies legislation. Congress should also fully fund LIHEAP to assist low income consumers with their energy usage. Third, there should not be arbitrary restrictions on the use of natural gas to provide electricity to consumers.

Throughout America, people are paying attention to the price of natural gas. Whether it is the homeowner who uses natural gas for heat, the fertilizer manufacturer who uses natural gas as a feedstock, or the electricity generator whose operating costs are substantially influenced by the cost of natural gas, all are paying careful attention to the current cash and forward prices of natural gas. EEl appreciates the opportunity to submit written testimony and to address the concern that generators have with the current and foreseeable imbalance between natural gas demand and supply.

SHORT TERM RECOMMENDATIONS IMPROVE ENERGY EFFICIENCY

There are some useful short term actions the federal government can take to address end-use efficiency of natural gas. For example, through the Energy Star program, the government can promote the purchase of high-efficiency gas furnaces and boilers for those homeowners and businesses with old systems that need to be replaced. For homeowners with gas water heaters, the government can educate consumers about the new efficiency standards that will take effect in January 2004, and help consumers find units that exceed those standards. For consumers and businesses with newer equipment, there should be promotion of tune-ups before the winter season or the lowering of thermostats where possible (e.g., down to 120 F or lower on gas water heaters and below 68 F for gas furnace/boiler systems).

For homeowners with gas water heaters and older water using appliances, the Energy Star program can be used to promote Energy Star dishwashers and clothes washers, which significantly reduce the usage of hot water. In addition, the government could encourage people not to purchase cooking equipment with continuously burning standing pilot lights.

The government can also "lead by example" by making sure that gas-fired equipment at its facilities are well-maintained, that new equipment purchased exceeds Energy Star standards, and that all thermostats and setback controls function properly.

LONG TERM RECOMMENDATION: INCREASE SUPPLY

While we believe there are limited opportunities regionally for reducing short term demand for gas in our sector—primarily by encouraging large industrial users to shift some of their use to off-peak times of consumption—there are longer term solutions for assuring adequate natural gas supplies in this country. These include efforts to encourage the wise use of energy and careful policies to identify, tap and bring to market available known reserves and new sources—both here and abroad. It is the combination of increased supply and the efficient use of that resource that will result in lower natural gas prices. EEI recognizes that the current natural gas situation did not develop overnight, nor will it be resolved overnight. We recommend that the Nation embark on a program to augment natural gas supply through the following:

(1) prompt passage of enabling legislation to allow certification of pipeline capacity for Arctic natural gas. This will enable market signals to determine when and how Arctic gas will make it to markets in the lower-48;

(2) increased domestic production of natural gas where there are proven gas reserves, including, where appropriate, onshore and offshore federal lands that are currently off limits. We recognize that this step will be politically difficult, but as Federal Reserve Board Chairman Alan Greenspan pointed out in his testimony before the House Energy Committee on June 10, Congress must find the appropriate balance in energy and environmental policy that will assure to the American economy and the American people low-cost, competitive energy while protecting the environment;

(3) rapid approval by the Department of Energy of Liquified Natural Gas (LNG) import applications, coupled with streamlined certification of infrastructure projects (LNG terminals and requisite pipeline facilities) by the Federal Energy Regulatory Commission (FERC) and the U.S. Coast Guard and, as important, timely approvals by states under the Coastal Zone Management Act and the Clean Water Act;

(4) development of deepwater resources throughout the Gulf of Mexico; and

(5) advocacy of vigorous conservation programs for residential, commercial, and industrial users of natural gas through federal, state, and utility-delivered programs designed to utilize natural gas more efficiently. For example, well-maintained and tuned-up furnaces and boilers can help reduce natural gas demand by more efficient applications, thereby having a positive impact on supply.

LONG TERM RECOMMENDATION: ENHANCE FUEL DIVERSITY AND INFRASTRUCTURE

The electric power industry is searching for ways to continue the production of low-cost electricity essential for the United States to compete in a global economy. From our perspective, one of the most important steps Congress and the President can take is to advance federal policies that will assure the availability of an adequate and diverse fuel supply for the generation of electricity. Fuel diversity means that coal, nuclear, hydro, wind, solar, natural gas—and other fuel sources as they become available—can be used by generators of electricity to mitigate price or supply risk in any one source. It also means "fuel switching" or maintaining a "dual fuel capability," where natural gas-fired plants are constructed. Permit conditions should be developed that allow for switching between natural gas and oil products in times of either high prices or limited natural gas supplies.

Policies advanced by the Congress and the Administration need to maximize the diversity of fuel sources available for the generation of electricity while allowing market forces to dictate the choice, in any given circumstance, of how to assure the low-cost production of electricity. Fuel diversity needs to include the ability to move large blocks of power between regions so that diverse electric supplies can move into various regions. For example, the potential of wind development throughout The Great Plains is limited by a lack of high-voltage transmission lines to carry the abundant raw resource to markets, either East or West. A more robust transmission system would expand inter-regional powerflows, providing a more diverse generation mix to regions that now have limited fuel options.

Stimulation of investment in transmission will do little to help if permitting and siting of new transmission lines continues to take more than a decade. EEI acknowledges the positive language contained in S. 14 on permitting and recommends to the Senate the more specific provisions in H.R. 6, the House Energy bill. These provisions give the Department of Energy (DOE) lead agency authority to coordinate the federal authorization process for transmission lines and establishes project specific coordination requirements. Another provision gives last-resort backstop siting

authority to FERC. Together with the corridor designation provisions H.R. 6, such new provisions will do a great deal to introduce transparency into the permitting process and facilitate timely siting decisions.

As transmission is helpful in distributing electricity, a market basket of generating technologies (coal, nuclear, hydroelectric and renewables as well as natural gas) is helpful to fuel diversity and price stability. The price of converting different fuels to electricity varies by technology, but generally, the broader the selection of technologies and fuels available to the generator, the better for all classes of customers. When hydro generating capacity is reduced by a non-functional and prolonged hydro licensing process and federal policies unnecessarily hinder the appropriate use of coal, the short fall in generating capacity must be made up elsewhere. Carefully established hydro and coal policies that allow these fuel sources to continue to play a serious role in the nation's fuel mix will help alleviate pressure on natural gas supply. EEI vigorously supports the licensing provisions of Title III of the Senate Energy bill because they will improve the functionality of the hydroelectric licensing process.

The current Clean Air Act's complex and multiple, overlapping requirements for electric power generators constrain the use of coal generation. This puts additional regulatory pressure on using natural gas to generate electricity. The Clear Skies Act (S. 485) would reduce such pressures on natural gas by providing certainty to coal generators, while achieving roughly 70 percent emission reductions in sulfur dioxide, nitrogen oxides and mercury emissions over a timeframe that would promote immediate environmental improvements and industry stability through certain and cost-effective emissions reductions. In contrast, both the Clean Power Act (S. 366) and the Clean Air Planning Act (S. 843) would severely exacerbate natural gas cost and supply concerns. In addition, current Clean Air Act New Source Review (NSR) policy and guidelines exacerbate the natural gas challenge because NSR creates great uncertainty for coal-based power generators.

Congress should be certain that federal energy, environmental and economic policies do not: (1) inadvertently create a policy climate wherein one fuel, such as natural gas, becomes the only practical option for new generation; (2) effectively preclude the use of certain abundant and low-cost fuels; or (3) sharply limiting the generators' flexibility to select a fuel mix that can optimize the production of electricity, thereby providing low cost power to consumers. In addition, EEI supports Congressional efforts to reauthorize and extend the production tax credits for renewable energy sources as the best means of incentivizing renewable technologies.

THE VALUE OF NATURAL GAS AS A FUEL FOR GENERATING ELECTRICITY

Electricity is the backbone of the modern economy. Advancements in technology have increased U.S. productivity and driven growth, but technology depends on ever increasing amounts of electricity. Currently, coal generation provides 50.1% of the nation's electricity supply, nuclear generation provides 20.3%, natural gas provides 18.1%, hydropower and other renewables provide 9.1%, and oil generation provides 2.4%.

In the past 10 years, natural gas-fired generation has been critical to providing the low-cost electricity that is crucial to assuring that the United States can compete in the global economy. Natural gas has become the default fuel for new power plants because plants fueled by natural gas are highly efficient, have predictable and short construction cycles, and produce lower emissions. The trend was aided by the historically low cost of natural gas and the pressures on the costs of the other traditional sources of fuel for generating electricity.

While natural gas-only-fired power plants account for 18% of the fuel used by all generation nationwide, 88% of the new electric capacity built in the last 10 years use natural gas as their primary, and in many cases only, fuel. The percentage of natural gas used as fuel for electric generation will most likely increase in the future. There are good reasons for this.

First, power plants fired by natural gas have become very efficient. Combustion turbines fueled by natural gas (simple cycle) were originally designed to augment large baseload producers of electricity (coal, nuclear, and hydroelectricity). They run for brief periods of time or a few hours annually to help meet peaking requirements. By being smaller and specialized, the combustion turbine minimized the capital costs of construction and could be quickly installed. Simple cycle power plants became especially desirable when the nation had excess baseload supply and when cost overruns were common in the construction of baseload units, particularly for nuclear projects.

During the 1990's, the emergence of higher efficiency combustion turbines accelerated the role played by natural gas-fired power plants in the nation's generation

mix. The "Heat Recovery Steam Generator," where waste heat from a combustion turbine is used to produce steam and turn a steam turbine—hence the term "combined cycle"—created efficiencies greater than 50% per each BTU of energy combusted. This compares to efficiency rates of 35-40% for coal plants. Highly efficient combined cycle plants in 2003 now have an efficiency rate over 55%. Thus, some are now being used for baseload operations, rather than just for peaking or load-following.

Second, the construction lead-times for natural gas-fired generation are shorter than those for coal and nuclear plants. This benefits owners and developers by limiting the exposure of capital because there is a shorter period when costs are being incurred but no electricity is being sold.

Third, construction costs for gas-fared generation are easier to estimate and much less likely to be subject to construction cost over-runs than other types of power plants. This also makes it easier for owners and investors to take the risk of investing millions of dollars in a new power plant.

Fourth, it is much easier to get environmental permits for natural gas power plants because of their lower emissions profile relative to more traditional coal or oil units. There is also a belief in the financial community that gas-fired plants have less regulatory risk. They have, therefore, been easier to finance than other more capital-intensive types of generating plants.

Fifth, natural gas has traditionally been a relatively cheap fuel source.

Sixth, natural gas-fired units can often be sited to optimize location on both the natural gas transmission system and the high-voltage electric transmission system.

Finally, for the electric system, one crucial advantage of natural gas technology is its quick start capability and ability to move from zero output in a combustion turbine, to full power in less than an hour. A combined cycle takes longer than the combustion turbine because of the longer time required to receive power out of the heat recovery steam generator. This ability to easily "load follow" is very helpful in an industry that constantly rebalances supply to serve customers instantaneously (for voltage control purposes).

We recognize that load following presents challenges to the natural gas transmission industry that, if not coordinated with pipeline dispatch operations, can create operational difficulties. The amount of gas demanded by a combustion turbine going to full power or shutting down rapidly because of fall-off in electricity demand can create imbalances in the pipeline system. Natural gas storage and even liquefied natural gas (LNG) helps in managing operational requirements of gas-fired generation. Further development of storage facilities throughout the natural gas market area, including LNG facilities, will be crucial to the balancing of gas supply and demand, and to electric operations.

In some regions of the country, dependence on natural gas is pronounced. For example, in the gas-producing Southwest, some utilities came to rely on natural gas as a boiler fuel for electric production when other market uses for natural gas were not well developed. Because utilities were using boilers to generate electricity, they could switch fuels from natural gas to various grades of oil for either price or supply reasons. Some of these units are now being retired, further reducing the fuel flexibility of the electric industry. Only 24% of the 168,760 MW of gas-fired generation in operation since 1993 have dual fuel capability, and that percentage is declining. RDI's PowerDat data base predicts that by 2011, only 7% of the 188,215 MW of new natural gas capacity planned is identified to have dual fuel capability. The figure of 188,215 MW represents 71% of total new electric generation under construction until 2011. While some new gas-fired power plants can burn oil, there are three main impediments to actually making the switch to oil. The physical requirements of the combustion turbine, such as increased maintenance needs and possible warranty limitations from the turbine manufacturer, discourage switching to oil. Environmental permits may preclude the use of oil because of increased NO_X emissions associated with the use of distillate oil (1702). Finally, many local zoning regulations do not allow the construction of oil storage tanks.

All of these factors associated with the loss of dual fuel capability at gas-fired power plants add inflexibility to the increased demand for natural gas in generating electricity. The increased demand, along with weather conditions, economic growth, and increased end use demand for natural gas—such as the 70% of new homes that are built each year with natural gas heating systems, can contribute to higher natural gas commodity prices and greater price volatility.

The United States benefits from robust and diverse natural gas supplies. Congress, the Administration and the FERC should publicly encourage the development of new production, new pipeline capacity, and market-area storage to assist in meeting the demand of the electricity producer and other end users of natural gas. EEI supports the oil and natural gas production incentive provisions in the Senate and

House energy bills and, as previously mentioned, believes Congress can do more to assure low-cost, competitive energy, while protecting the environment.

There are those who advocate end-use restraints on natural gas. These are not appropriate solutions for addressing natural gas supply and demand problems. The market has the ability to manage supply, and over time will return to equilibrium. The market needs to be allowed to send price signals that will stimulate investment in alternative generating technologies, dual-fuel opportunities, and development of capital intensive new gas supplies. End-use restraints, even if applied prospectively, have the potential to create considerable economic inefficiency and would be counterproductive.

For those concerned about impacts of high natural gas prices on residential gas users directly, and electricity customers indirectly, we urge Congress to fully fund LIHEAP and other consumer related organizations assisting those who have a difficult time paying monthly utility bills. EEI strongly recommends that the Congress appropriate the full $3.4 billion authorized for LIHEAP funding for FY '04. Weatherization program expenditures can assist those in need by reducing their demand for space heating or cooling.

CONCLUSION

In conclusion, the use of natural gas to create electricity has been good for consumers and should remain an accessible fuel source for electric generators. There are strong economic, efficiency, and environmental reasons to use natural gas in the generation of electricity. Even if, as a nation, we transition to greater reliance on other diverse fuel sources and generation technologies, natural gas will continue to be a necessary backstop. It is therefore essential that we take the steps that are necessary to assure an adequate supply,. It is also crucial, however, that Congress and the president provide greater regulatory certainty to the generators of electricity—particularly as to the environmental standards which new and existing generating sources of all types will have to meet—and that the permitting and siting processes be streamlined to reduce the current long-lead times.

STATEMENT OF DAVID N. PARKER, PRESIDENT & CHIEF EXECUTIVE OFFICER, AMERICAN GAS ASSOCIATION, WASHINGTON, DC

EXECUTIVE SUMMARY

The American Gas Association represents America's local natural gas utilities. AGA member companies acquire natural gas supply for, and distribute it to, 53 million homes and businesses. As a result, adequate supplies of competitively priced natural gas are of critical importance to AGA and its member companies. Similarly, ample supplies of reasonably priced natural gas are of critical importance to the millions of consumers that AGA members serve. We are here today to speak for those consumers.

The natural gas industry is currently at a critical crossroads. The "gas bubble" of the 1980s and 1990s disappeared prior to the winter of 2000-2001. Supply and demand is now in precarious balance. The industry today no longer basks in prodigious supply; rather, it treads a supply tightrope, bringing with it unpleasant and undesirable economic and political consequences—most importantly high prices and higher price volatility. Both consequences harm natural gas consumers—residential, commercial, and industrial.

Since the beginning of this year, the circumstances in which our industry finds itself have become plainly evident through significantly higher natural gas prices. Natural gas prices have consistently hovered around or above $5 per thousand cubic feet in most wellhead markets. Similarly, the forward price curve in recent months for natural gas traded in futures markets has reached an all-time high. Simply put, natural gas prices are high, and the marketplace is predicting that they will stay high.

Energy is the lifeblood of our economy. Millions of Americans rely upon natural gas to heat their homes, and high prices are a serious drain on their pocketbooks. High, volatile natural gas prices also put America at a competitive disadvantage, cause plant closings, and idle workers. Directly or indirectly, natural gas is critical to every American.

It is expected that natural gas demand will increase by approximately 50 percent over the next two decades. This growth will occur because natural gas is the most environmentally friendly fossil fuel and is an economic, reliable, and homegrown source of energy. It is in the national interest that natural gas be available to serve the demands of the market. The federal government must address these issues and

take prompt and appropriate steps to ensure that the nation has adequate supplies of natural gas at reasonable prices.

Many of the fields from which natural gas is currently being produced are mature. Over the last two decades, technological advances have greatly enhanced the ability to find natural gas as well as to produce the maximum amount possible from a field. While technology will undoubtedly continue to progress, technology alone will not be sufficient to maintain or increase our domestic production.

As Federal Reserve Chairman Greenspan noted in his testimony, today's tight natural gas markets have been a long time in coming but there are still numerous unexploited sources of gas production in the United States. Today, we are not running out of natural gas and we are not running out of places to look for natural gas. Nevertheless, we are running out of places where we are allowed to look for gas. The truth that must be confronted now is that, as a matter of policy, this country has chosen not to develop much of its natural gas resource base.

If America's needs for energy are to be met, there is no choice other than for exploration and production activity to migrate into new, undeveloped areas. There is no question that the nation's natural gas resource base is rich and diverse. It is simply a matter of taking E&P activity to the many areas where we know natural gas exists. Regrettably, many of these areas—largely on federal lands—are either totally closed to exploration and development or are subject to so many restrictions that timely and economic development is not possible. As we contemplate taking these steps, it is important that all understand that the E&P business is—again as a result of technological improvements—enormously more environmentally benign today than it was 25 years ago. In short, restrictions on land access that have been in place for many years need to be reevaluated if we are to address the nation's current and future energy needs.

The House of Representatives has recognized these concerns, which are plainly evident in H.R. 6. We are also gratified that this committee recognized them in passing S. 14. The most important next step the entire Congress can take to address these pressing issues is to enact a comprehensive energy bill with provisions ensuring that lands where natural gas is believed to exist are available for environmentally sound exploration and development. Additionally, it is appropriate to create incentives to seek and produce this natural gas. These steps are necessary to help consumers and the economy.

WRITTEN TESTIMONY

I am David N. Parker, President & Chief Executive Officer of the American Gas Association ("AGA"). AGA is grateful for the opportunity to share its views with you on the critical importance to the nation of ensuring ample natural gas supplies at competitive prices. Doing so is necessary for the nation—both to protect consumers and to address the energy and economic situations we currently face.

AGA is composed of 191 natural gas distribution companies, which deliver gas throughout the United States. Local gas utilities deliver gas to more than 64 million customers nationwide. AGA members deliver approximately 83 percent of this natural gas.

AGA members are charged with the responsibility, under local law or regulation, of acquiring natural gas for the majority of their customers and delivering it in a safe and reliable manner. Having an ample supply of natural gas at reasonable prices is a critical issue for AGA and its members. AGA members and the consumers they serve share both an interest and a perspective on this subject.

It is important to understand that the bread and butter business of AGA members is acquiring and delivering natural gas to residential, commercial, and industrial consumers across America. Our members remain economically viable by delivering natural gas to consumers at the lowest reasonable price, which we do by operating our systems—over a million miles of distribution lines—as efficiently as possible. Exploring for and producing natural gas is the business of our energy-industry colleagues in the oil and gas business, whether they are major, independent, or "Mom and Pop" operators. We are not here to speak for them today, but their continued success in providing natural gas to America's consumers is of the utmost importance to us as well. Today, we are here to speak for consumers who want reasonable heating bills and good jobs.

I have three objectives today. First, I will briefly explain why natural gas prices have jumped this year. Second, I will describe the magnitude of the natural gas supply challenge facing this country over the next two decades. Third, I will recommend a number of steps that Congress can take to help bring natural gas prices down in the long term.

AGA is encouraged that Congress is addressing this increasingly critical issue. This year we have been privileged to testify before this Committee, the House Resources Committee, and the House Energy and Commerce Committee with regard to the challenging issue of natural gas supply. We also are gratified that H.R. 6, the Energy Policy Act of 2003, which was passed by the House of Representatives in April 2003, contains a wide array of provisions designed to bring forth more of America's prodigious supply of natural gas to benefit consumers. That bill is without question more focused on natural gas supply than were the iterations under consideration in 2001 and 2002. Similarly, we are gratified by the efforts of this Committee in approving S. 14 and the efforts of the Senate Finance Committee in approving S. 1149. Both bills contain important, substantial provisions aimed at solving our natural gas supply situation.

Adequate natural gas supply is crucial to all of America for a number of reasons. It is imperative that the natural gas industry and the government work together to take significant action in the very near term to assure the continued economic growth, environmental protection, and national security of our nation. The tumultuous events in energy markets over the last two years serve to underscore the importance of adequate and reliable supplies of reasonably priced natural gas to consumers, to the economy, and to national security.

AGA wishes to commend the leadership of the Committee for convening this important hearing so promptly after considering S. 14. To be sure, there has been a crescendo of public policy discussion with regard to natural gas supply since the "Perfect Storm" winter of 2000-2001. Nevertheless, in the time since AGA first testified on Capitol Hill in February and March of this year, the volume and the tenor of this discussion have increased dramatically. Simply put, this issue becomes more critical with every passing day.

Since the beginning of this year, natural gas has been trading in wellhead markets throughout the nation at prices floating between $5 and $6 per thousand cubic feet. This has not been a "price spike" of the sort that we have seen in the past, lasting several days or perhaps several weeks. Rather, it has been sustained over a period of several months. And there is no sign that it will substantially abate in the near future. Indeed, quotes for futures prices on NYMEX over the next 24 months have recently reached a consistent record level mirroring cash prices.

In the course of the last several months, business consumers of natural gas have been raising a cry of concern over natural gas prices. And this concern has touched businesses of all stripes. In Connecticut, for example, pizza shops complain that their natural gas bills have increased $500-700 per month. The chemical and pharmaceutical industry, which uses 10% or more of the U.S. gas supply annually, has been reeling from increased natural gas prices. It has been projected that the chemical industry in Louisiana will lose at least 2,000 jobs as a result of high gas prices. Similarly, a major chemical company in Mississippi has declared bankruptcy, citing natural gas prices. That industry needs gas prices between $2.50 and $3.00 per thousand cubic feet to remain competitive on the world stage, while prices since the beginning of the year have been averaging in the range of $5.00 per thousand cubic feet. Similarly, fertilizer plants, where natural gas can represent 80% of the cost structure, are closing one facility after another. Glass manufacturers, which also use large amounts of natural gas, have reported earnings falling by 50% as a result of natural gas prices. In our industrial and commercial sector, competitiveness in world markets and jobs at home are on the line.

Businesses and factories tend to purchase most of their own gas, and they quickly feel increases in prices. Residential customers, in contrast, typically rely upon their local utilities to act as merchants on their behalf. As a result of the manner in which state approved regulatory mechanisms operate, most consumers will not begin to feel current high gas prices for months.

This winter, some families will pay hundreds of dollars more to heat their homes, which will be hundreds of dollars less they will have to spend on other things. Families will again be forced to make difficult decisions between paying the gas bill, buying a new car, or saving for future college educations. There are, of course, state and federal programs such as LIHEAP to assist the most needy. This winter the potential price increases will affect all families—those on fixed income, the working poor, and the lower-income group, as well as those caught between living comfortably and living day to day.

America received its first wake-up call on natural gas supply two years ago when a confluence of events—a cold winter, a hot summer and a surging economy—created the so-called "perfect storm." This jump in demand sent natural gas prices soaring. Drilling boomed, supply grew (slightly), demand fell, and gas prices retreated—just what one would expect from a competitive, deregulated natural gas market. Falling natural gas prices predictably led to a slowdown in drilling. The in-

dustry drilled 30% fewer gas wells in 2002 than in 2001. This downturn in drilling in 2002 set the stage for another run-up in prices this year.

Today, natural gas prices are back at winter 2001 levels because demand is up and supply is down. Demand is up in part because we had a normal winter. Frankly, consumers are fortunate we did not have a colder-than-normal winter. Moreover, high oil prices this year are propping up natural gas prices. In certain markets, notably the U.S. Northeast, gas competes with oil products. Unlike in 2001, when high gas prices led to the substitution of oil for gas, substitution has not kicked in as quickly this year as it did two years ago. Meanwhile, while demand is up, U.S. natural gas production in the fourth quarter of 2002 was down about 4% from the fourth quarter of 2001. Indeed, U.S. natural gas production today is lower than it was five years ago—despite a big jump in drilling in recent years.

The level of gas prices we are experiencing today could unleash a firestorm of protest in the fall and winter of this year as some consumers may see their natural gas bills double. The next twelve months may make the winter of 2000-2001 look tame from the perspective of consumers, regulators, and legislators. If history is any guide, angry consumers will soon be calling on Congress to "do something" about high natural gas prices. Some forward-looking state public utility commissions, having learned from the 2000-2001 experience, are beginning to express concern over the possible impact of the winter of 2003-2004. Last month, the Secretary of Energy held a Natural Gas Summit with the National Petroleum Council to address the situation.

These are only the first few alarms in what seems likely to become a very difficult year. Unless we make the proper public policy choices—quickly—we will be facing many more difficult years.

The natural gas industry is presently at a critical crossroads. The question before you today is: What will that crossroads look like? Will it look like a brand new interstate highway? Or will it look like a 100-car collision on a Los Angeles freeway? It is important to remember that at the heart of this intersection are America's consumers.

For the past three years, natural gas production has operated full-tilt to meet consumer demand. The "surplus deliverability" or "gas bubble" of the late 1980's and 1990's is simply gone. No longer is demand met while unneeded production facilities sit idle. No longer can new demand be met by simply opening the valve a few turns. The valves have been, and presently are, wide open.

The supply tightrope has brought with it several inexorable and unpleasant consequences—prices in the wholesale market have gone up, and that market has become much more volatile. During the 2000-2001 heating season, for example, gas prices moved from the $2 level to approximately $10 and back again to nearly $2. Such volatility hurts consumers, puts domestic industry at a competitive disadvantage, closes plants, and idles workers. The winter of 2000-2001 made it abundantly clear to us (and to you as well) that consumers dislike these price increases and the market volatility that is now an everyday norm. Unless significant actions are taken on the supply side, gas markets will remain tumultuous, and 63 million gas customers will suffer the consequences. Today's recurrent $5 price levels may represent a new, and regular, level of natural gas prices for the foreseeable future, although this prospect can be moderated with aggressive and enlightened public policy.

As gas utilities, we have a number of programs in place to insulate consumers to some extent from the full impact of wholesale price volatility, but consumers must ultimately pay the price that the market commands. We believe that there will be considerable economic and political pushback should natural gas prices stabilize at the current $5 level for anything but a brief period of time.

The problem that we face today is not simply one of finding means to meet current demands in the market for natural gas. Rather, we are in a growing market, and the demand for natural gas in the U.S. is expected to increase 50 percent by 2015-2020. Growth seems inevitable because natural gas is a clean, economic, and domestic source of available energy. It does not face the environmental hurdles of coal and nuclear energy, the economic and technological drawbacks of most renewable energy forms, or the national security problems associated with imported oil.

In its recent *Annual Energy Outlook 2003*, the Energy Information Administration predicts that U.S. natural gas consumption will increase at an average rate of 1.8% per year to about 35 trillion cubic feet per year in 2025, from 22.7 trillion cubic feet in 2001. Much of this growth in natural gas demand will occur in the electricity market. In fact, the U.S. now has over 150,000 megawatts of new gas-fired power plants on line that did not exist in the summer of 1999—the equivalent of about 70 Diablo Canyon nuclear power plants.

A 35 trillion cubic foot market implies an increase in average daily gas supply from about 60 billion cubic feet per day today to about 95 billion cubic feet per day

in 2025—a 35 billion-cubic-foot-per-day increase in deliverability. (To give you some perspective on this potential increase, current production from the entire Gulf of Mexico is only about 14 billion cubic feet per day, and imports from Canada are about 10 billion cubic feet per day.)

The challenge for both government and industry is quite straightforward: to ensure that both the current and future needs for natural gas are met at reasonable and economic prices. There can be no responsible question that facilitating this result is sound public policy. Natural gas is abundant domestically and is the environmentally friendly fuel of choice. Ensuring adequate natural gas supply will lead to reasonable prices for consumers, will dampen the unacceptable volatility of wholesale natural gas markets, will help keep the economy growing, and will help protect the environment.

America has a large and diverse natural gas resource; producing it, however, can be a challenge. Providing the natural gas that the economy requires will necessitate: (1) providing incentives to bring the plentiful reserves of North American natural gas to production and, hence, to market; (2) making available for exploration and production the lands—particularly federal lands—where natural gas is already known to exist so gas can be produced on an economic and timely basis; (3) ensuring that the new infrastructure that will be needed to serve the market is in place in a timely and economic fashion.

Natural gas—our cleanest fossil fuel—is found in abundance throughout both North America and the world. It currently meets one-fourth of the United States' energy needs. Unlike oil, about 99 percent of the natural gas supplied to U.S. consumers originates in the United States or Canada.

The estimated natural gas resource base in the U.S. has actually increased over the last several decades. In fact, we now believe that we have more natural gas in the U.S. than we estimated twenty years ago, notwithstanding the production of more than 300 trillion cubic feet of gas in the interim. This is true, in part, because new sources of gas, such as coalbed methane, have become an important part of the resource base. Nonetheless, having the natural gas is not the same as making that natural gas available to consumers. That requires natural gas production.

Natural gas production is sustained and grows only by drilling in currently productive areas—or by exploring in new areas. Over the past two decades a number of technological revolutions have swept across our industry. We are able today to drill for gas with dramatically greater success and with a significantly reduced environmental impact than we were able to do twenty years ago. We are also much more efficient in producing the maximum amount of natural gas from a given area of land. A host of technological advances allows producers to identify and extract natural gas deeper, smarter, and more efficiently. For example, the drilling success rate for wells deeper than 15,000 feet has improved from 53 percent in 1988 to over 82 percent today. In addition, gas trapped in coal seams, tight sands, or shale is no longer out of reach.

While further improvements in this regard can be expected, they will not be sufficient to meet growing demand unless they are coupled with other measures. Regrettably, technology alone cannot indefinitely extend the production life of mature producing areas. New areas and sources of gas will be necessary.

Notwithstanding the dramatic impact of innovation upon our business, the inevitable fact today is that we have reached a point of rapidly diminishing returns with many existing natural gas fields. This is almost entirely a product of the laws of petroleum geology. The first ten wells in a field may ultimately produce 60 percent of the gas in that field; yet it may take forty more wells to produce the balance. In many of the natural gas fields in America today, we are long past those first ten wells and are well into those forty wells in the field. In other words, the low-hanging fruit have already been picked in the orchards that are open for business.

Drilling activity in the U.S. has moved over time, from onshore Kansas, Oklahoma and Arkansas to offshore Texas and Louisiana, and then to the Rocky Mountains. Historically, we have been quite dependent on fields in the Gulf of Mexico. But recent production declines in the shallow waters of the Gulf of Mexico have necessitated migration of activity to deeper waters to offset this decline. These newer, more expensive, deepwater fields tend to have short lives and significantly more rapid rates of decline in production than is the case with onshore wells.

The sobering reality is that America's producers are drilling a lot more wells today than they were five years ago. Nevertheless, supply is still down. U.S. gas producers are on an accelerating treadmill, running harder just trying to stay in place. For reasons that are partly due to technology, and partly due to the maturing of the accessible natural gas resource base, a typical well drilled today will decline at a faster rate than a typical well drilled a decade ago. Moreover, because up to

half of this country's current natural gas supply is coming from wells that have been drilled in the past five years, this decline trend is likely to continue.

Before we can meet growing gas demand, we must first replace the perennial decline in production. The U.S. natural gas decline rate will be in the range of 26-28 this year. In practical terms, if all drilling stopped today, in twelve months U.S. natural gas production would be 26-28% lower than it is today. The accelerating decline rate helps explain why U.S. gas deliverability has been stuck in the 52-54 billion cubic feet per day range for the past eight years, notwithstanding an increase in gas-directed drilling.

In short, America's natural gas fields are mature—in fact, many are well into their golden years. There is no new technology on the horizon that will permit us to pull a rabbit out of a hat in these fields. These simple, and incontrovertible, facts explain why we are today walking a supply tightrope and why the winter of 2000-2001 may become a regular occurrence, particularly at the point the economy returns to its full vigor. Having the winter of 2000-2001 return every year will undoubtedly put a brake on the economy, once again causing lost output, idle productive capacity, and lost jobs.

If we are to continue to meet the energy demands of America and its citizens and if we are to meet the demands that will they make upon us in the next two decades, we must change course. It will not be enough to make a slight adjustment of the tiller or to wait three or four more years to push it over full. Rather, we must come full about, and we must do it in the very near future. Lead times are long in our business, and meeting demand years down the road requires that we begin work today.

We have several reasonable and practical options. It is clear that continuing to do what we have been doing is simply not enough. In the longer term we have a number of options:

First, and most importantly, we must increase natural gas production by looking to new frontiers within the United States. Further growth in production from this resource base is jeopardized by limitations currently placed on access to it. For example, most of the gas resource base off the East and West Coasts of the U.S. and the Eastern Gulf of Mexico is currently closed to any exploration and production activity. Moreover, access to large portions of the Rocky Mountains is severely restricted. The potential for increased production of natural gas is severely constrained so long as these restrictions remain in place.

To be direct, America is not running out of natural gas, and it is not running out of places to look for natural gas. America is running out of places where we are allowed to look for gas. The truth that must be confronted now is that, as a matter of policy, this country has chosen not to develop much of its natural gas resource base. We doubt that that many of the 63 million American households that depend on natural gas for heat are unaware that this choice has been made on their behalf.

In this vein, the Rocky Mountain region is expected to be a growing supplier of natural gas, but only if access to key prospects is not unduly impeded by stipulations and restrictions. Two separate studies by the National Petroleum Council and the U.S. Department of the Interior reached a similar conclusion—that nearly 40 percent of the gas resource base in the Rockies was restricted from development to some degree, some partially and some totally. On this issue, the Department of the Interior noted that there are nearly 1,000 different stipulations that can impede resource development on federal lands.

One of the most significant new gas discoveries in North America in the past ten years is located just north of the U.S./Canada border in eastern Canadian coastal waters on the Scotian shelf. Natural gas discoveries have been made at Sable Island and Deep Panuke. Gas production from Sable Island already serves Canada's Maritimes Provinces and New England through an offshore and land-based pipeline system. This has been done with positive economic benefits to the region and without environmental degradation. This experience provides an important example for the United States, where we believe that the offshore Atlantic area has a similar geology.

In some areas we appear to be marching backward. The buy-back of federal leases where discoveries had already been made in the Destin Dome area (offshore Florida) of the eastern Gulf of Mexico was a serious step back in terms of satisfying consumer gas demand. This action was contrary to what needs to be done to meet America's energy needs. With Destin Dome we did not come full about, as we need to do; rather, we ran from the storm.

Geographic expansion of gas exploration and drilling activity has for the entirety of the last century been essential to sustaining growth in natural gas production. Future migration, to new frontiers, to new fields, in both the U.S. and Canada, will also be critical. Without production from geographic areas that are currently subject

to access restrictions, it is not at all likely that producers will be able to continue to provide increased amounts of natural gas from the lower-48 states to customers for longer than 10 or 15 years. We believe that the same is true in Canada as well.

Quite simply, we do not believe that there is any way, other than exploring for natural gas in new geographic areas, to meet America's anticipated demand for natural gas unless we turn increasingly to sources located outside North America.

In the middle of the 20th century, when the postwar economy had begun its half-century climb and when natural gas became the fuel of choice in America, our colleagues in the producing business opened one new natural gas field after another in the mid-continent. In this era, it was not that difficult to produce a triple or a home run virtually every inning. As those fields developed, producers continued to hit a regular pattern of singles and doubles, with the occasional triple or home run in new discovery areas. This same pattern in the mid-continent was repeated in the Gulf of Mexico. Today, however, it is extremely difficult to find the new, open areas where the producing community can continue to hit the ball. As things are today, America has confined them to a playing field where only bunts are permitted. The Yankees did not get to the World Series playing that kind of game.

AGA does not advance this thesis lightly. Over the past two years both the American Gas Association and the American Gas Foundation have studied this important issue vigorously. We have believed for several years that it is necessary for policy makers to embrace this thesis so that natural gas can continue to be—as it has been for nearly a century—a safe and reliable form of energy that is America's best energy value and its most environmentally benign fossil fuel. We think that events in gas market in 2003 underscore that our concerns have been on the mark.

When the first energy shock transpired in the early 1970s, the nation learned, quite painfully, the price of dependence upon foreign sources of crude oil. We also learned, through long gasoline lines and shuttered factories, that energy is the lifeblood of our economy. Nevertheless, thirty years later, we are even more dependent upon foreign oil than we were in 1970. Regrettably, the nation has since failed to make the policy choices that would have brought us freedom from undue dependence on foreign-source energy supplies. We hope that the nation can reflect upon that thirty-year experience and today make the correct policy choices with regard to its future natural gas supply. We can blame some of the past energy problems on a lack of foresight, understanding, and experience. We will not be permitted to do so again.

Meeting our nation's ever-increasing demand for energy has an impact on the environment, regardless of the energy source. The challenge, therefore, is to balance these competing policy objectives realistically. Even with dramatic improvements in the efficient use of energy, U.S. energy demand has increased more than 25 percent since 1973, and significant continued growth is almost certain. Satisfying this energy demand will continue to affect air, land, and water. A great American success story is that, with but five percent of the world's population, we produce nearly one-third of the planet's economic output. Energy is an essential—indeed critical—input for that success story both to continue and to grow.

It is imperative that energy needs be balanced with environmental impacts and that this evaluation be complete and up-to-date. There is no doubt that growing usage of natural gas harmonizes both objectives. Finding and producing natural gas is accomplished today through sophisticated technologies and methodologies that are cleaner, more efficient, and much more environmentally sound than those used in the 1970s. It is unfortunate that many restrictions on natural gas production have simply not taken account of the important technological developments of the preceding thirty years. The result has been policies that deter and forestall increased usage of natural gas, which is, after all, the nation's most environmentally benign and cost-effective energy source.

Natural gas consumers enjoyed stable prices from the mid-1980s to 2000, with prices that actually fell when adjusted for inflation. Today, however, the balance between supply and demand has become extremely tight, creating the tightrope effect. Even small changes in weather, economic activity, or world energy trends result in wholesale natural gas price fluctuations. We saw this most dramatically in the winter of 2000-2001. We may be seeing it today on a longer-term basis.

In the 1980s and '90s, when the wholesale (wellhead) price of traditional natural gas sources was around $2 per million British thermal units, natural gas from deep waters and Alaska, as well as LNG, may not have been price competitive. However, most analysts suggest that these sources are competitive when gas is in a $3.00 to $4.00 price environment. Increased volumes of natural gas from a wider mix of sources will be vital to meeting consumer demand and to ensuring that natural gas remains affordable.

Increasing natural gas supplies will boost economic development and will promote environmental protection, while achieving the critical goal of ensuring more stable prices for natural gas customers. Most importantly, increasing natural gas supplies will give customers—ours and yours—what they seek: reasonable prices, greater price stability, and fuel for our vibrant economy. On the other hand, without policy changes with regard to natural gas supply, as well as expansion of production, pipeline and local delivery infrastructure for natural gas, the natural gas industry will have difficulty meeting the anticipated 50 percent increase in market demand. Price increases, price volatility, and a brake on the economy will be inevitable.

Second, we need to increase our focus on non-traditional sources, such as liquefied natural gas (LNG). Reliance upon LNG has been modest to date, but it is clear that increases will be necessary to meet growing market demand. Today, roughly 99 percent of U.S. gas supply comes from traditional land-based and offshore supply areas in North America. Despite this fact, during the next two decades, non-traditional supply sources such as LNG will likely account for a significantly larger share of the supply mix. LNG has become increasingly economic. It is a commonly used worldwide technology that allows natural gas produced in one part of the world to be liquefied through a chilling process, transported via tanker, and then re-gasified and injected into the pipeline system of the receiving country. Although LNG currently supplies less than 1 percent of the gas consumed in the U.S., it represents 100 percent of the gas consumed in Japan.

LNG has proven to be safe, economical and consistent with environmental quality. Due to constraints on other forms of gas supply and increasingly favorable LNG economics, LNG is likely to be a more significant contributor to U.S. gas markets in the future. It will certainly not be as large a contributor as imported oil (nearly 60 percent of U.S. oil consumption), but it could account for 10-15 percent of domestic gas consumption 15-20 years from now if pursued aggressively and if impediments are reduced.

It is unlikely that LNG can solve the entirety of our problem. About ten new LNG import terminals have been proposed, each with capacities of about 1 billion cubic feet per day. Even if all of these LNG terminals were built (which is frankly not a likely scenario), LNG would only supply about 10-15% of the expected market in 2025 of 35 trillion cubic feet. Given the intense "not on our beach" opposition to siting new LNG terminals, a major supply impact from LNG may be a tall order indeed.

Third, we must tap the huge potential of Alaska. Alaska is estimated to contain more than 250 trillion cubic feet—enough by itself to satisfy U.S. natural gas demand for more than a decade. Authorizations were granted twenty-five years ago to move gas from the North Slope to the Lower-48, yet no gas is flowing today nor is any transportation system under construction. Indeed, every day the North Slope produces approximately 8 billion cubic feet of natural gas that is re-injected because it has no way to market. Alaskan gas has the potential to be the single largest source of price and price volatility relief for U.S. gas consumers. Deliveries from the North Slope would not only put downward pressure on gas prices, but they would also spur the development of other gas sources in the state as well as in northern Canada.

Fourth, we can look to our neighbors to the north. Canadian gas supply has grown dramatically over the last decade in terms of the portion of the U.S. market that it has captured. At present, Canada supplies approximately 15 percent of the United States' needs. We should continue to rely upon Canadian gas, but it may not be realistic to expect the U.S. market share for Canadian gas to continue to grow as it has in the past or to rely upon Canadian new frontier gas to meet the bulk of the increased demand that lies ahead for the United States.

The pipelines under consideration today from the Prudhoe Bay area of Alaska and the Mackenzie Delta area of Canada are at least five years from reality. They are certainly facilities that will be necessary to broaden our national gas supply portfolio. We must recognize, however, that together they might eventually deliver up to 8 billion cubic feet per day to the lower 48 States, just 8% of the 95 billion cubic feet per day that is envisioned for the 2025 market.

I would like to return to my first point above. There is much talk today of the need for LNG, Alaska gas, and Canadian gas. There is no question that we need to pursue those supplies to meet both our current and future needs. Nonetheless, it is equally clear that, in order to meet the needs of the continental United States, we will need to look principally to the lower 48 States.

RECOMMENDATIONS

To promote meeting consumer needs, economic vitality, and sound environmental stewardship, the American Gas Association urges Congress as follows:

Current restrictions on access to new sources of natural gas supply must be reevaluated in light of technological improvements that have made natural gas exploration and production more environmentally sensitive.

Federal and state officials must take the lead in overcoming the pervasive "not in my backyard" attitude toward energy infrastructure development, including gas production.

Interagency activity directed specifically toward expediting environmental review and permitting of natural gas pipelines and drilling programs is necessary, and agencies must be held responsible for not meeting time stipulations on leases, lease review, and permitting procedures.

Federal lands must continue to be leased for multi-purpose use, including oil and gas extraction and infrastructure construction.

Both private and public entities should act to educate the public regarding energy matters, including energy efficiency and conservation. Federal and state agencies, with private sector support and involvement, should strive to educate the public on the relationship between energy, the environment, and the economy. That is, energy growth is necessary to support economic growth, and responsible energy growth is compatible with environmental protection.

Economic viability must be considered along with environmental and technology standards in an effort to develop a "least impact" approach to exploration and development but not a "zero impact".

Existing moratoria for onshore lands should be lifted.

The geologic conditions for oil and gas discovery exist in the U.S. mid-Atlantic area, the Pacific Offshore area, and the eastern portion of the Gulf of Mexico.

- Although some prospects have been previously tested, new evaluations of Atlantic oil and gas potential should be completed using today's technology—in contrast to that of 20 to 30 years ago.
- The federal government should facilitate this activity by lifting or modifying the current moratoria regarding drilling and other activities in the Atlantic Offshore, in the Pacific Offshore, and in the Gulf of Mexico to ensure that adequate geological and geophysical evaluations can be made and that exploratory drilling can proceed.
- The Destin Dome (181 lease area) should immediately be offered for lease for oil and gas exploration.
- The federal government must work with the States to assist—not impede—the process of moving natural gas supplies to nearby markets should gas resources be discovered in commercial quantities. Federal agencies and states must work together to ensure the quality of the environment, but they must also ensure that infrastructure (such as landing an offshore pipeline) is permitted and not held up by multi-jurisdictional roadblocks.

The Federal government should continue to permit royalty relief where appropriate to change the risk profile for companies trying to manage the technical and regulatory risks of operations in deepwater.

Tax provisions such as percentage depletion, expensing geological and geophysical costs in the year incurred, Section 29 credits, and other credits encourage investment in drilling programs, and such provisions are often necessary, particularly in areas faced with increasing costs due to environmental and other stipulations.

The Coastal Zone Management Act (CZMA) is being used to threaten or thwart offshore natural gas production and the pipeline infrastructure necessary to deliver natural gas to markets in ways not originally intended. Companies face this impediment even though leases to be developed may be 100 miles offshore. These impediments must be eliminated or at least managed within a context of making safe, secure delivery of natural gas to market a reality.

The U.S. government should work closely with Canadian and Mexican officials to address the challenges of supplying North America with competitively priced natural gas in an environmentally sound manner.

Renewable forms of energy should play a greater role in meeting U.S. energy needs, but government officials and customers must realize that all forms of energy have environmental impacts.

Construction of an Alaskan natural gas pipeline must begin as quickly as possible.

Construction of this pipeline is possible with acceptable levels of environmental impact.

The pipeline project would be the largest private sector investment in history, and it would pose a huge financial risk to project sponsors. Many believe the project may not be undertaken without some form of federal support.

The Federal Energy Regulatory Commission (FERC) announced in December 2002 that it would not require LNG terminals to be "open access" (that is, common carriers) at the point where tankers offload LNG. This policy will spur LNG development because it reduces project uncertainty and risk.

Other federal and state agencies should review any regulations that impede LNG projects and act similarly to reduce or eliminate these impediments.

Efforts should be made to encourage existing LNG terminals to commence operating at full capacity at the earliest opportunity.

The siting of LNG offloading terminals is generally the most time-consuming roadblock for new LNG projects. Federal agencies should take the lead in demonstrating the need for timely approval of proposed offloading terminals, and state officials must begin to view such projects as a means to satisfy supply and price concerns of residential, commercial and industrial customers.

Some new LNG facilities should be sited on federal lands so that permitting processes can be expedited.

Congress should increase LIHEAP funding. Low-income energy assistance is currently provided to roughly 4 million households, only 15 percent of those eligible. The financial burden on needy families will certainly increase this winter, and LIHEAP appropriations should be increased to $3.4 billion—up from $2.0 billion of total assistance in 2003.

Should gas supplies become extremely tight, the federal government and the States should consider easing environmental restrictions on a temporary basis so that electric generating facilities and industrial facilities can switch to alternative fuels.

States should be encouraged to authorize local utilities to enter into fixed-price long-term contracts and/or natural gas hedging programs as a means of dampening the impact of natural gas price volatility upon consumers.

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