The Dow Chemical Company

STATEMENT FOR THE RECORD

COMMITTEE ON ENERGY AND NATURAL RESOURCES

UNITED STATES SENATE

HEARING ON

The Role of Natural Gas in Mitigating Climate Change
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Introduction

The Dow Chemical Company appreciates the opportunity to submit these written comments to the Committee on Energy and Natural Resources.

Dow was founded in Michigan in 1897 and is one of the world's leading manufacturers of chemicals and plastics. We supply more than 3,300 products to customers in approximately 160 countries, connecting chemistry and innovation with the principles of sustainability to help provide everything from fresh water, food, and pharmaceuticals to insulation, paints, packaging, and personal care products. About 21,000 of Dow's 46,000 employees are in the US, and Dow helps provide health benefits to more than 34,000 retirees in the US.

Dow is committed to sustainability. We have improved our performance on greenhouse gas (GHG) emissions, and we are committed to do even better in the future. Our ambitious 2015 sustainability goals underscore this commitment.

Dow is an energy-intensive company. Dow uses energy, primarily naphtha, natural gas and natural gas liquids, as feedstock materials to make a wide array of products essential to our economy and quality of life. We also use energy to drive the chemical reactions necessary to turn our feedstocks into useful products, many of which lead to net energy savings.

This testimony describes the current US energy situation and recommends specific policies to ensure a sustainable energy policy for the United States. Particular attention is focused on natural gas prices, which have and continue to affect the US manufacturing sector.

Dow believes that natural gas will play a critical role in US policy to control greenhouse gases. Because US manufacturing jobs are dependent on the US natural gas market, policies that impact natural gas will have a direct impact on jobs in the US manufacturing sector. We recommend that Congress consider policies that utilize natural gas in ways that preserve the competitiveness of US manufacturers.

Natural Gas in Energy and Climate Policy

Natural gas is a relatively "clean" (in terms of GHG emissions per unit of energy) fossil fuel. Current estimates of the domestic supply of natural gas are greater than those of just a few years ago. Therefore, increased use of natural gas could help the United States reduce GHG emissions and reduce its reliance on foreign sources of energy. Climate change and energy security are two of the biggest challenges facing the United States, so policies that affect natural gas markets impact our collective well being.

Natural Gas Policy Is Critical to US Manufacturers

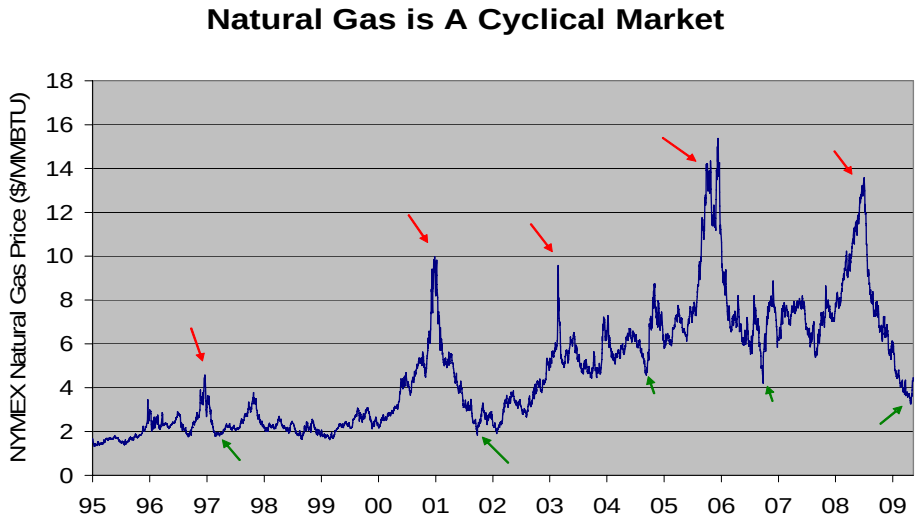
Major sectors that use natural gas include the power, industrial, residential, commercial, and transportation sectors. Those sectors in which demand is most sensitive to natural gas prices are termed price elastic. The more elastic the demand, the more quickly a sec-

tor will change its demand for natural gas after a change in price. Inelastic demand occurs when a change in price results in little change in demand. Of the sectors previously identified, the industrial sector has the most elastic demand for natural gas. From 1997 to 2008, US industrial gas demand fell 22% as average annual prices rose 167%. Over the same time, demand for power rose 64% (EIA data). Clearly, a change in natural gas price will impact industrial sector demand before that in other sectors.

Both price volatility and the "average" price over time have an impact on the industrial sector and should be addressed by a comprehensive energy policy.

Price Volatility in the US Natural Gas Market

Since 1997, there have been five natural gas price spikes, each caused by lags between price signals and production response. The lag between changes in drilling and changes in production has been remarkably consistent, at about six months. This is the time required to fund drilling programs, site wells, schedule crews, drill and tie new wells into the grid. When the gas market is over supplied, producers respond by reducing drilling, leading to a reduction in supply.



In 2009, as in 2002, 2004 and 2006, drilling has declined dramatically as price has fallen. After each trough, natural gas demand and price rise once the economy turns, signaling the production community to increase drilling. During the lag between the pricing signals and new production, only one mechanism exists to rebalance supply and demand: demand destruction brought about by price spikes. Demand destruction is an antiseptic economic term for job destruction.

These price spikes have significantly contributed to the US manufacturing sector losing over 3.7 million jobs, the chemical industry losing nearly 120,000 jobs, and the permanent loss of nearly half of US fertilizer production capacity. The manufacturing sector, which has limited fuel switching ability, has become the shock absorber for high natural gas costs.

Although increased supply from shale gas appears to have changed the production profile, we have seen similar scenarios occur after past spikes. In 1998, significant new imports from Canada came on line; in 2002-2003, there were new supplies from the Gulf of Mexico and in 2005, new discoveries in the Rockies were brought into play. In each case, the initial hopes were too high and production increases were not as large as initially expected. Some claim that the lag expected for shale gas will be shorter due to the reduced drilling scope of shale type wells. However the latest available data show natural gas production peaked with the same delay from the start of drilling reductions as in other cycles. The inherent lags between changes in drilling and production created natural gas spikes over the last ten years, and will continue to do so after this and every trough.

The next table shows the EIA-estimated levelized cost for new power plants by fuel type in 2030. This table shows that the levelized cost of a new power plant is equal across the four fuel types. However, the variable component of cost for natural gas fired generation is much greater than for other fuel choices. This means that electricity consumers served by natural gas will experience the biggest price shocks. Along with manufacturers who rely on natural gas, consumers of electricity generated by natural gas are among those who will be most negatively affected by price spikes in the natural gas market.

Table. Power Generated from Natural Gas Is Much More Susceptible to Price Shocks than that from Coal, Nuclear or Wind

	Natural Gas	Coal	Nuclear	Wind
Levelized Power Generation Cost from EIA	2007 Mills/ KWH			
2030 Base Line	82	83	82	82
% of Total Cost Which is Variable	74%	23%	12%	0%
Cost with fuel at Highest Quarter in 2000's	113	92	83	82
Cost with fuel at Lowest Quarter in 2000's	39	73	81	82
Price variability (High vs. Low)	**74**	**19**	**2**	**0**

Note: Power projections for 2030 from 2009 Annual Energy Outlook Figure 57. Gas prices are for NYMEX HH, Coal for Illinois Basin, Nuclear based on % change in 2000's - all from Bloomberg. High and Low Quarter costs estimate the 2030 Levelized cost assuming fuel at the highest and lowest quarterly costs seen in the years 2000-9

We believe that the increased supply of natural gas from shale plays will be an important resource for the United States over the next decades. However, as has been demonstrated in previous cycles, this new production will not end the cyclicality of natural gas markets. Placing a price on GHG emissions will also not overcome the most important factors affecting volatility of natural gas prices (e.g., weather).

When it comes to natural gas and climate policy, Congress should consider policies that minimize the demand destruction that occurs in natural gas price spikes. This means sup-

porting price elastic consumers of natural gas and avoiding the disproportionate addition of inelastic demand.

Average Price Level in the US Natural Gas Market

It is not just price spikes in natural gas that hurt US manufacturers. It is also the average level of natural gas prices. Much of the US chemical industry was built when natural gas prices were below $2/MMBtu. Since 2001, this historic price level has been exceeded, maybe forever. We do not expect US natural gas prices to return consistently to this low level in the future.

Because manufacturers that depend on competitive natural gas prices must make capital investment decisions that span decades, the US faces stiff competition from abroad. In fact, in our 2005 testimony before this Committee, Dow stated that of the 120 world scale petrochemical plants proposed to be built, only one was planned for the US.

Should the US enact a price on GHG emissions, the net impact on supply and demand balances must be considered in cases of both average and extreme demand. The country's energy supply must be resilient enough to overcome natural phenomena such as hurricanes, harsh winters, and arid summers. It must continue to support economic growth, allowing for high-value job creation in the industrial sector. Without this resiliency, natural gas price volatility will increase, affecting both employment in the industrial sector and all electricity users.

EIA modeling of the House-passed energy and climate bill indicate how to avoid a "dash to gas" in the power sector under a cap and trade program. If new power plants using nuclear, renewable, and coal with associated carbon capture and sequestration (CCS) are not developed and deployed in a timeframe consistent with emission reduction requirements, covered entities will respond by increasing their use of offsets, if available, and by turning to increased use of natural gas in lieu of coal-fired generation. Therefore, it is critical to advance all low carbon emitting energy sources and ensure the availability of offsets under any cap and trade program.

Relationship between the Price of Carbon and Fuel Switching

A price on GHG emissions will increase demand for natural gas relative to other fuels that emit more GHGs per unit of energy. Demand is also influenced by the relative price of natural gas compared to other fuels in the absence of a price on GHG emissions. Both these factors—the relative price differential and the price of GHG emissions—work together to influence fuel switching. For example, if the price of natural gas is only slightly higher than the price of coal, then fuel switching from coal to natural gas will occur at a relatively low price on carbon. Conversely, if the price of natural gas is much higher than the price of coal, then it would take a higher price on carbon to impact fuel switching from coal to natural gas.

In practice, major investment decisions—such as in power generation—can impact fuel choices for decades. Therefore, investors project the relative price of natural gas and coal and the expected carbon price over the entire time period of the investment. Due to the

much higher capital cost of coal-fired power generation plants, greater uncertainty in price outcomes for power or green house gas emissions raises the cost of capital for new power projects, and favors natural gas generation. A well-considered, comprehensive, and timely energy policy will both lower the cost of power for American consumers and reduce the impact of implementing policies to address GHG's.

For policy makers, the lesson to be learned is straightforward: The higher the expected carbon price, the greater the degree of fuel switching from coal to natural gas in the power sector. Therefore, cost containment is key to minimizing fuel switching under any climate policy that places a price on carbon. Under a cap and trade system, cost containment depends on the reduction schedule over time and on the availability of offsets (and international offsets in particular).

Recommended Policies

When it comes to natural gas and climate policy, Dow favors policies that will avoid the demand destruction that occurs in natural gas price spikes, along with policies that will allow the US to use all of its low-carbon resources. Such policies will maintain industrial competitiveness.

Dow also believes that the US needs a sustainable energy policy. Climate change is an important component of a sustainable energy policy, but it is not the only part. We have developed a list of specific recommendations that, if implemented, would form the basis of a sustainable energy policy.

First, aggressively promote the cleanest, most reliable, and most affordable "fuel"— energy efficiency. Energy efficiency is the consensus solution to advance energy security, reduce GHGs, and keep energy prices low. It is often underappreciated for its value. Of particular importance is improving the energy efficiency of buildings. Buildings are responsible for 38% of CO2 emissions, 40% of energy use, and 70% of electricity use. A combination of federal incentives and local energy efficiency building codes is needed.

Second, increase and diversify domestic energy supplies, including natural gas. Nuclear energy and clean coal with carbon capture and sequestration (CCS) should be part of the solution, as should solar, wind, biomass, and other renewable energy sources. We believe a price on carbon will advantage natural gas, and further incentives would only dangerously increase inelastic demand. Therefore, Congress should not provide free allowances or other incentive payments for the purpose of promoting fuel switching from coal to natural gas in the power sector.

An estimated 86 billion barrels of oil and 420 trillion cubic feet of natural gas are not being tapped. History suggests that the more we explore, the more we know, and the more our estimates of resources grow. EIA has said that "the estimate of ultimate recovery increases over time for most reservoirs, the vast majority of fields, all regions, all countries, and the world." And we have the technology that allows us to produce both oil and natural gas in an entirely safe and environmentally sound manner. Any new fossil energy resources must be used as efficiently as possible.

One way to maximize the transformational value of increased oil and gas production is to share the royalty revenue with coastal states and use the federal share to help fund research, development and deployment in such areas as energy efficiency and renewable energy**.** Production of oil and gas on federal lands has brought billions of dollars of revenue into state and federal treasuries. Expanding access could put billions of additional dollars into state and federal budgets.

Third, act boldly on technology policy through long-term tax credits, and increased investment in R&D and deployment. These are costly but necessary to provide the certainty that the business community needs to spur investment. We didn't respond to Sputnik with half-measures. We can't afford to respond to our energy challenges with half-measures, either.

Fourth, employ market mechanisms to address climate change in the most cost-effective way. There is a need for direct action now to slow, stop, and then reverse the growth of greenhouse gas levels in the atmosphere. We concur with the principles and recommendations of the US Climate Action Partnership (USCAP), of which Dow is a proud member. And we recognize that concerted action is needed by the rest of the world to adequately address this global problem. Particular attention must be paid to cost containment and the availability of offsets (and international offsets). Also, climate policy should not penalize the use of fossil energy as a feedstock material to make products that are not intended to be used as a fuel.

To minimize the downsides of natural gas price volatility, Congress should adopt policies to increase the number of elastic users of natural gas, and consider policies to increase US supply of natural gas. A resilient natural gas market would empower US manufacturers to create high value jobs as they did from 1983-1996, during which period US industrial gas use grew at an average rate of 2.7%/yr. In the event weather increases natural gas demand, price sensitive exports would be temporarily reduced, rebalancing the natural gas market with less disruption. Under this scenario, price spikes won't be as severe, and won't cause as much harm when they occur, which is ultimately good for both industry and all consumers.

Under this scenario we can envision a circumstance in which the chemical industry is once again able to preferentially invest in the US.

Conclusion

Natural gas will play a critical role in US climate policy. US manufacturing jobs are closely linked to natural gas price and price volatility. The policy choices Congress will make on natural gas are therefore critical to US manufacturers. Without industrial gas users, any disruption in supply or demand must be met by dramatic price changes.

Energy efficiency should become a national priority. Congress should enact legislation to create a sustainable energy supply based on all sources of domestic energy, including nuclear energy. Technology policy should create powerful incentives for clean energy technologies, such as CCS. A price on carbon, coupled with appropriate cost contain-

ment measures, would be a large and sufficient incentive to promote US natural gas demand, which is already growing even in the absence of a price on carbon.

There is no one silver bullet solution to our energy and climate problems. All Americans paid a high price for over-reliance on natural gas in the last ten years. Our country cannot afford to repeat that mistake. This time we must fashion a comprehensive energy policy which addresses supply and demand realities, and environmental, security and economic goals to ensure energy costs in the US remain globally competitive and avoid economically devastating volatility.