

JOINT ECONOMIC COMMITTEE OF THE UNITED STATES

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PREPARED TESTIMONY:

**AMERICA'S NATURAL GAS REVOLUTION:
WHAT IT MEANS FOR JOBS AND ECONOMIC GROWTH**

by Dr. Daniel Yergin¹

Vice Chair Klobuchar and Chair Brady and members of the Committee,

It is an honor to speak with you today about how America's energy position has been transformed over the last half decade by what is happening with energy and, specifically natural gas, and the new opportunities this provides for economic growth and employment.

One is cautious about using the word "revolution"; but, given the scale of the change, it is appropriate to describe what is unfolding in the United States in terms of shale gas and tight oil as an "unconventional revolution in oil and gas". Natural gas production increased 27 percent between 2007 and 2013. Estimates of recoverable natural gas reserves have more than doubled

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since 2005. U.S. oil production has increased 3.3 million barrels per day since 2008 – a 66 percent increase. This increase alone is larger than the output of 11 of 12 OPEC countries.

It has become apparent that the impact goes far beyond energy itself. Since 2009, we at IHS have engaged in several studies to better understand and quantify the dramatic economic contributions associated with this unconventional revolution.

- By 2012, the unconventional natural gas and oil activity was already supporting more than 2.1 million jobs across a vast supply chain—a considerable accomplishment given the relative newness of the technology. About 60 percent of these jobs – 1.3 million – were from shale gas activity; the rest from tight oil.
- We expect the total number of jobs to rise to 3.3 million by 2020 – with 1.8 of those jobs from shale gas.
- In 2012, this revolution added \$74 billion to federal and state government revenues, a number that we project to rise to about \$125 billion by 2020.²

What is now becoming clear is that the lower costs of energy brought about by this abundant growth in natural gas supply is helping to stimulate a manufacturing renaissance and improving the competitive position of the United States in the global economy and further stimulating job creation in the United States. Overall, the unconventional revolution – shale gas and tight oil – has helped to strengthen the U.S. economy and has proved to be an important contributor to the U.S. economic recovery. A few months ago, former Federal Reserve Chairman Ben Bernanke described the unconventional revolution as “one of the most beneficial developments if not the

² IHS, *America's New Energy Future: the Unconventional Oil and Gas Revolution and the United States Economy*, vol. 1 *National Economic Contributions* (October 2012); vol. 2, *State Economic Contributions* (December 2012); vol. 3 *A Manufacturing Renaissance*.

most beneficial development since 2008” in the economy.³ The unconventional revolution came along at the right time. One might well wonder how our economy would look today without it – much higher energy bills, higher unemployment, lower growth.

How did the unconventional revolution develop and how big is this natural gas revolution?

It took about two decades for the development of the technological base. But, since 2008, the unconventional revolution has unfolded rapidly. As recently as just six years ago it was widely assumed that a permanent era of energy shortage was at hand. The country, it seemed, was on a path to spending several hundreds of billions of dollars more every year on imports to meet oil and natural gas demand. How different things look today. US crude oil output, after a nearly 40 year decline, has increased dramatically, as recounted above.

With respect to natural gas, in just six years, US Lower 48 natural gas production has risen from 52 billion cubic feet (bcf) per day in 2007 to 66 bcf per day in 2013 – a 27 percent increase. This rapid rise was driven primarily by shale gas production. Today, unconventional natural gas activity accounts for nearly 67 percent of total U.S. lower-48 natural gas productive capacity and is projected to rise to nearly 75 percent by the end of the decade. This “unconventional gas” includes shale gas, tight gas, and coal bed methane. Shale gas alone accounts for 44 percent of total natural gas production – compared to 2 percent a little over a decade ago. Estimates of the recoverable natural gas resource base in the US Lower-48 have grown from about 1,400 Tcf in 2005 to a conservative estimate of about 3,000 Tcf today.⁴ This includes proved reserves as well as probable and possible resources and includes conventional resources as well as

³ IHS CERAWEEK, March 7, 2014

⁴ Energy Information Administration; Potential Gas Committee; IHS.

unconventional resources. Total natural gas consumption in the US Lower 48 in 2013 was 70 Bcf per day, or 25.7 Tcf for the year. This means that US Lower 48 resources are sufficient to supply current consumption rates for over 100 years.

This rapid rise in unconventional production has also enhanced US energy security. Six years ago, due to constrained production, the United States seemed locked into importing increasing amounts of liquefied natural gas (LNG) and was heading towards spending as much as \$100 billion dollars annually on future imports. Now, these newly available resources ensure that the United States will need, at most, minimal LNG imports to balance supply with demand. Instead of debates over US imports, there is the opportunity to begin exporting some of the domestic surplus, as well as the potential for using natural gas in some classes of vehicles.

How has this shale gas and tight oil revolution affected the economy and individual states?

While various states had begun to home in on the economic development aspects of shale gas and tight oil, it was only in last few years that its significance for the national economy started to come into focus. We have undertaken a series of studies to assess the economic impact of the unconventional revolution. The studies have examined the national and state-by-state impacts and the impact on manufacturing.⁵

So far, as already noted, this unconventional revolution supported more than 2,1 million jobs in 2012—direct, indirect, and induced. Looking towards the future, the industry will continue to contribute to strong job growth bringing the total to 3.3 million workers by the end of this decade. The federal budget continues to be a source of great concern. Thus, it is significant to

⁵ IHS, *America's New Energy Future: the Unconventional Oil and Gas Revolution and the United States Economy*, vol. 1 *National Economic Contributions* (October 2012), vol. 2, *State Economic Contributions* (December 2012), and vol. 3 *Manufacturing Renaissance* (Sept. 2013). . vol. 3, *A Manufacturing Renaissance*

observe the impact on revenues arising from this energy revolution.. Between 2012 and 2035, unconventional activity is expected to generate nearly \$1.6 trillion in cumulative government revenues.

Strikingly, the economic impacts are not limited to states that produce natural gas and oil. Owing to the long supply chains, the job impacts are being experienced across the United States, including in states without significant shale gas or tight oil activity.⁶ In other words, when it comes to unconventional activity, a state does not need to have a major unconventional play within its geographic boundaries to benefit economically from the activity. In fact, more than a quarter of all jobs associated with the unconventional energy revolution are found in states with no appreciable unconventional activity. For example:

- *Minnesota* supplies – among other items – many of these special sands required for hydraulic fracturing. The economic activity directly and indirectly supported over 19,000 jobs in the state in 2012 and is expected to increase to nearly 35,000 jobs by 2020. In 2012, it generated over \$525 million in taxes for state and federal coffers. This includes over \$260 million in state and local taxes
- *Wisconsin* is an important supplier of the special sands required in unconventional extraction using hydraulic fracturing techniques. Machinery manufacturers in the state also provide significant oil and gas field machinery to the unconventional activity around the country. As a result, in 2012 Wisconsin's economic activity

⁶ Producing states are defined as those that are part of the 20 largest unconventional oil and natural gas producing plays in the US Lower 48, such as the Bakken and Marcellus Shale plays. Non-Producing states are not part of the 20 largest unconventional oil and natural gas producing plays in the US Lower 48 and are not part of an emerging oil or natural gas play in the 2012 to 2035 forecast horizon. These states may be part of plays that are currently producing oil and/or natural gas, but nevertheless are classified as non-producing states, because current production is relatively small and the prospect for future unconventional production is unknown.

associated with unconventional production directly and indirectly supported nearly 20,000 jobs and generated \$330 million in state and local taxes.

- In *Illinois*, the supply chains supporting unconventional oil and gas production directly and indirectly supported more than 38,600 jobs and generated over \$1 billion in taxes for state and federal coffers. This includes \$450 million in state and local taxes. This employment is expected to increase to just over 66,600 jobs by 2020.
- In *New York*, a state that currently bans unconventional activity, 44,000 jobs along with \$1 billion in state and local taxes can be attributed to activities supporting the supply-chain associated with shale gas and tight oil in other states across the country in 2012.
- In *California*, the economic activity associated with unconventional oil and gas produced in other states supported nearly 100,000 jobs in the state in 2012, mostly in the industrial and chemical manufacturing sectors. This number represents 8% of the state's total manufacturing jobs. These employment numbers are expected to increase 50% to 153,000 jobs by 2020. Another contribution of unconventional gas employment is to government revenues. In 2012, it generated nearly \$3 billion in taxes for state and federal coffers. This includes over \$1.6 billion in state and local taxes.

A key reason for the profound economic impact of the unconventional activity is the fact that it combines a capital-intensive industry with a broad domestic supply chain. The United States is a leader in all aspects of the unconventional industry, which means that most of its suppliers are domestically-based, and that means a larger portion of the dollars spent are supporting domestic

jobs in trucking, steel fabrication, information technology, aggregates, heavy equipment manufacturing, finance, hotels, housing, and restaurants, among many others.

Manufacturing Renaissance?

There are also significant implications for American manufacturing. Several factors are shifting the economics in favor of on-shoring and fueling the resurgence of manufacturing in the US. First, global labor wage rates for many off-shoring locations have significantly outpaced US wage increases, narrowing the wage gap. Second, in an increasingly advanced manufacturing world, technology is shifting the balance away from the importance of low cost labor toward higher skilled workforces. Third, a rapidly evolving energy landscape is fundamentally shifting the traditional economics around supply chains as higher oil prices are altering transportation costs and incentivizing companies to site manufacturing locations closer to end markets, thus making off-shoring less attractive;

But what looms largest is the new era of affordable and abundant domestic natural gas. This is creating significant competitive advantages for both energy intensive industries and their supply chains and industries that rely upon natural gas derivatives as critical feedstock into production.

As a result, companies are now committing or planning investments that in total are very significant. In his 2014 State of the Union Address, President Obama pointed to the large amount of new investment in U.S. industry as a result of lower natural gas prices. One new census finds \$117 billion of new investment announced just in petrochemical facilities.⁷ Other censuses of

⁷ State of the Union Address, January 28, 2014; American Chemistry Council, "Notes on Shale Gas and Manufacturing," June 2014.

investment range higher. The chemical industry is well positioned to capitalize on the benefits of this unconventional revolution. This industry is highly energy intensive, using energy inputs, mainly natural gas and natural gas liquids, as both the major fuel source and feedstock. The US chemical industry's feedstock prices are now among the lowest in the world. As a result, the US is gaining a decisive competitive advantage in the cost of producing basic petrochemicals like ethylene, ammonia, methanol, and their downstream derivative products. The chemical manufacturing industry currently stands as one of America's largest exporting industries with \$198 billion in annual exports that accounted for 13% of all US merchandise exports in 2012 and representing a 30 percent increase in value of net exports since 2007.

The investments are coming from many US based companies. Dow, for instance, has announced \$4 billion dollars of new investment in the United States owing to lower gas prices. Dow's chairman and CEO Andrew Liveris explained this shift thusly: "Manufacturing in the United States is undergoing a renaissance, facilitated in substantial part by reasonable and stable natural gas prices. For the first time in over a decade, domestic manufacturers in multiple industries, including petrochemicals, fertilizers, glass, aluminum and steel, are planning to invest in production facilities in the United States."⁸

But it also most notable that 62 percent of that \$117 billion represents foreign direct investment by non-U.S. companies. For instance,

- Methanex has announced plans to disassemble two \$500 million methonal plants in Chile to reassemble them in Geismar, Louisiana;

⁸ Andrew Liveris, Testimony, Senate Energy Committee, February 12, 2013.

- And since 2009, BASF has invested more than \$5.7 billion in North America to significantly expand production and take advantage of the lower gas prices.

Moreover, this manufacturing renaissance is carrying far beyond the petrochemical industries. Other industries – such as iron and steel fabrication –are seeing benefits as will industries that can take advantage of the economic opportunities being unlocked by all the activity associated with natural gas. These varied companies are committing many billions of dollars to additional investment in the United States. Again this includes foreign as well as U.S. companies. For example:

- Austrian steelmaker Voestalpine announced plans to invest \$715 million to build an iron-ore processing plant in Texas Investment that will double its total output by 2020 and mostly abandoning any major new investments in Europe.
- Siemens invested \$350 million in a new Gas Turbine facility to supply steam turbines and generators;

This new competitive advantage is recognized by both companies operating in Europe and now governments. Germany depends upon exports for about 50 percent of its GDP, compared to 13 percent for the United States. Germany's economy has been the foundation for Europe during these years of economic crisis, and its export prowess has been the envy of many nations.

But now there is widespread concern in both the German government and German industry about the loss of competitiveness to the United States owing to Germany's own high-cost energy strategy and the US' new energy advantage. Investment in industry in Germany is stagnating, while German companies, along with other European companies, are now making major commitments to investment in the United States. The German Economics Minister

warned of a “dramatic deindustrialization” of Germany owing to this disparity⁹. Earlier this month, in response to this situation, the German government indicated that it would consider the development of shale gas¹⁰.

How does this directly impact American households?

Finally, and perhaps most importantly, the unconventional gas revolution increased average household disposable income in 2012 by \$1,200 – a number that will grow to \$2,700 by 2020. Most of this is natural gas related: First, households spend less of their total income on utilities, whether directly for less-expensive natural gas or by lowering the cost of electricity generated with natural gas. Second, savings are passed on from the lower costs of goods and services in the broader economy as producers and retailers enjoy lower energy costs.

But an Immediate Risk

A word of caution to bring to the attention of this Committee because of its focus on the overall U.S. economy. While U.S. crude oil production has increased dramatically since 2008, the 3.3 million barrels per day increase has almost exactly balanced the amount of oil currently missing from the world market owing to disruptions in countries like Libya and Iraq and sanctions on Iran. In other words, the increase in U.S. oil production has compensated for loss of oil elsewhere. Without that increase, we would be looking at much higher oil prices than today.

⁹ IHS, *A More Competitive Energiewende: Securing Germany's Global Competitiveness in a New Energy World (2014)*, p. 1

¹⁰ *Financial Times*, June 4, 2014.

Iraq has been regarded as one of the key sources for new oil supplies for the world. The unfolding crisis in Iraq has removed, it appears, a couple of hundred thousand barrels per day from the world market. This – plus overall anxiety -- has led to relatively small increases in oil prices. Southern Iraq is the major source of Iraqi production. It is hundreds of miles from the current struggle in the north. But if either conflict or breakdown in governance or sabotage disrupts supplies from the southern region, then the world oil market could well enter into a crisis of supply, with prices spiking much higher than they are today. This would be a major setback for the U.S. and world economy. It is urgent to be prepared to deal with what may be an imminent risk.

Conclusion

Altogether, the unconventional natural gas and oil revolution has already had major impact in multiple dimensions—beginning with U.S. energy supply and costs and now extending to government revenues, manufacturing, household spending, and the wider economy. Its significance will continue to grow as it continues to unfold. These hearings provide a very timely opportunity for assessing that impact and significance in its many dimensions, and I am pleased to respond to the committee’s questions.