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COMMITTEE ON ENERGY AND NATURAL RESOURCES

U.S. SENATE

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Chair Landrieu, Ranking Member Murkowski, and Members of the Committee, I appreciate the opportunity to appear before you today at this hearing on the topic of *Importing Energy, Exporting Jobs, Can it be Reversed?*

The Energy Information Administration (EIA) is the statistical and analytical agency within the U.S. Department of Energy. EIA collects, analyzes, and disseminates independent and impartial energy information to promote sound policymaking, efficient markets, and public understanding regarding energy and its interaction with the economy and the environment. EIA is the nation's premier source of energy information and, by law, its data, analyses, and forecasts are independent of approval by any other officer or employee of the United States Government. The views expressed herein should therefore not be construed as representing those of the Department of Energy or any other federal agency.

As requested, my testimony focuses on natural gas. It draws on EIA's data covering production, stocks, demand, imports, exports, and prices; on our forecast of trends over the next one to two years that is updated each month in the *Short-term Energy Outlook (STEO)*. It also draws on long-term projections through 2040 that are updated each year in our *Annual Energy Outlook (AEO)*, including a variety of alternative cases to reflect the effect of key uncertainties on energy market outcomes.

Short Term: U.S. Natural Gas Production, Use and Trade

This winter of prolonged, widespread frigid weather throughout much of the United States led to a record-breaking natural gas withdrawal season, bringing inventories of natural gas to an

11-year low at the end of the current winter. EIA's weekly natural gas storage report issued on March 20 shows that stocks as of March 14 were 953 Billion cubic feet (Bcf). However, EIA forecasts for production and consumption indicate that operators will make record-high storage injections between April and October in order to substantially rebuild inventory levels. The demand response to higher natural gas prices should be particularly apparent in the electric power sector, where decisions made by operators regarding which power plants to run during shoulder demand periods are quite sensitive to relative fuel prices.

EIA expects total natural gas consumption will average 71.3 Bcf per day (Bcf/d) in 2014, a drop of 0.1 Bcf/d from 2013. The projected year-over-year increases in natural gas prices contribute to declines in natural gas used for electric power generation from 24.9 Bcf/d in 2012 to 22.3 Bcf/d in 2013 and 22.0 Bcf/d in 2014. In 2015, total natural gas consumption falls by 0.3 Bcf/d as a decline in residential and commercial consumption more than offsets consumption growth in the industrial and electric power sectors. EIA expects natural gas consumption in the power sector to increase to 22.6 Bcf/d in 2015 with the retirement of some coal plants.

Total marketed production averaged 70.2 billion cubic feet per day in 2013. The latest STEO forecasts natural gas marketed production to grow at an average rate of 2.5% in 2014 and 1.1% in 2015. U.S. natural gas production has increased significantly since 2005 mainly because of growth in production of shale gas resources. The recent rapid natural gas production growth in the Marcellus formation, centered in Pennsylvania, but also evident in West Virginia, is particularly noteworthy. Supply growth in the Northeast is causing natural gas forward prices in that region to fall even with or below Henry Hub prices outside of peak-demand winter months.

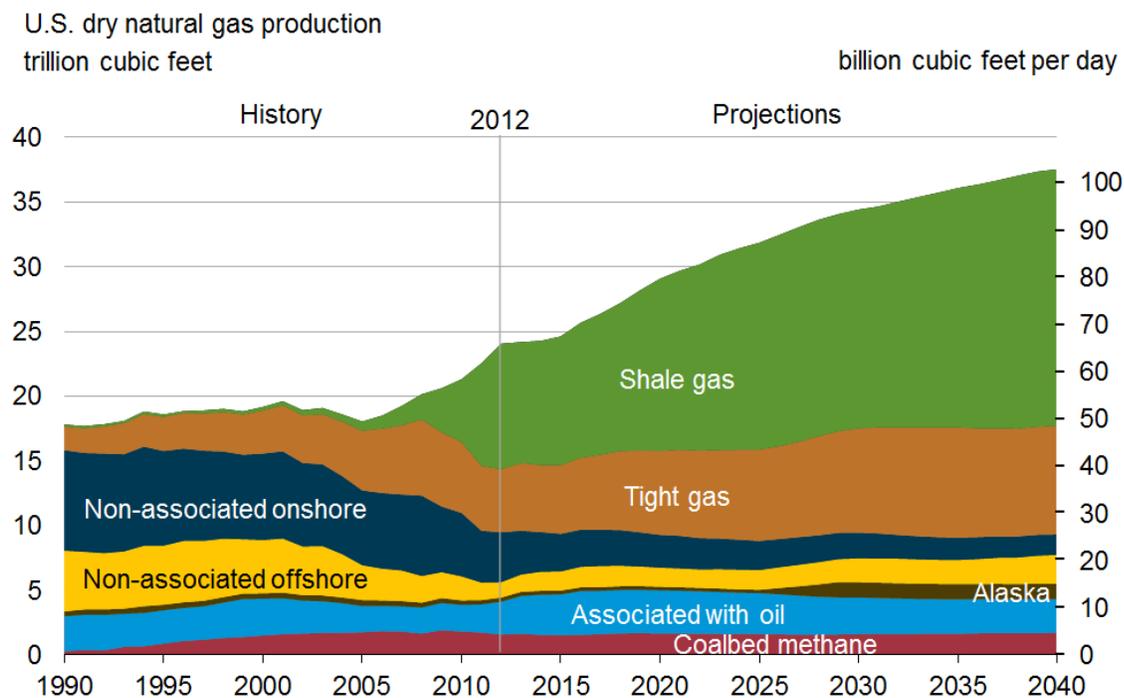
Consequently, some drilling activity may again shift towards Gulf Coast plays such as the Haynesville in Louisiana and the Barnett in Texas, where prices are closer to the Henry Hub spot prices.

Turning to natural gas trade, growing domestic production over the past several years has displaced some pipeline imports from Canada, while exports to Mexico have increased. EIA expects these trends will continue through 2015. EIA projects net natural gas imports of 3.6 Bcf/d in 2014 and 2.6 Bcf/d in 2015, which would be the lowest level since 1987. The latest AEO, which is discussed below, projects the United States will be a net exporter of natural gas beginning later in this decade.

The Long Term Outlook for U.S. Natural Gas

EIA released the Reference case projections for the Annual Energy Outlook 2014 (AEO2014) in December. The Reference case is intended to represent an energy future through 2040 based on given market, technological, and demographic trends; current laws and regulations; and consumer behavior. EIA recognizes that projections of energy markets are highly uncertain and subject to geopolitical disruptions, technological breakthroughs, economic fluctuations, and other unforeseeable events. In addition, long-term trends in technology development, demographics, economic growth, and energy resources may evolve along a different path than represented in the Reference case projections. The complete *AEO2014*, which will be released next month, includes a number of alternative cases that examine uncertainties and alternative assumptions regarding resources, technology advances, and world energy prices that can significantly affect projections for natural gas production, use, and trade.

In the *AEO2014* Reference case, natural gas production grows steadily, with a 56% increase between 2012 and 2040, when production reaches 37.6 trillion cubic feet (Tcf). Shale gas production is the largest contributor, growing by more than 10 Tcf, from 9.7 Tcf in 2012 to 19.8 Tcf in 2040. The shale gas share of total U.S. natural gas production increases to over 50%. Tight gas production and offshore gas production both increase significantly, but their share of total production remains relatively constant. Alaska’s natural gas production also increases during the projection period, driven by the opportunity for Alaska liquefied natural gas (LNG) exports to overseas customers, which is projected to be economic in the middle of the next decade.



Source: EIA, *Annual Energy Outlook 2014, Reference case*

One key uncertainty that influences projected U.S. natural gas production is the level of oil prices, relative to natural gas prices, which significantly affects projected use of natural gas in

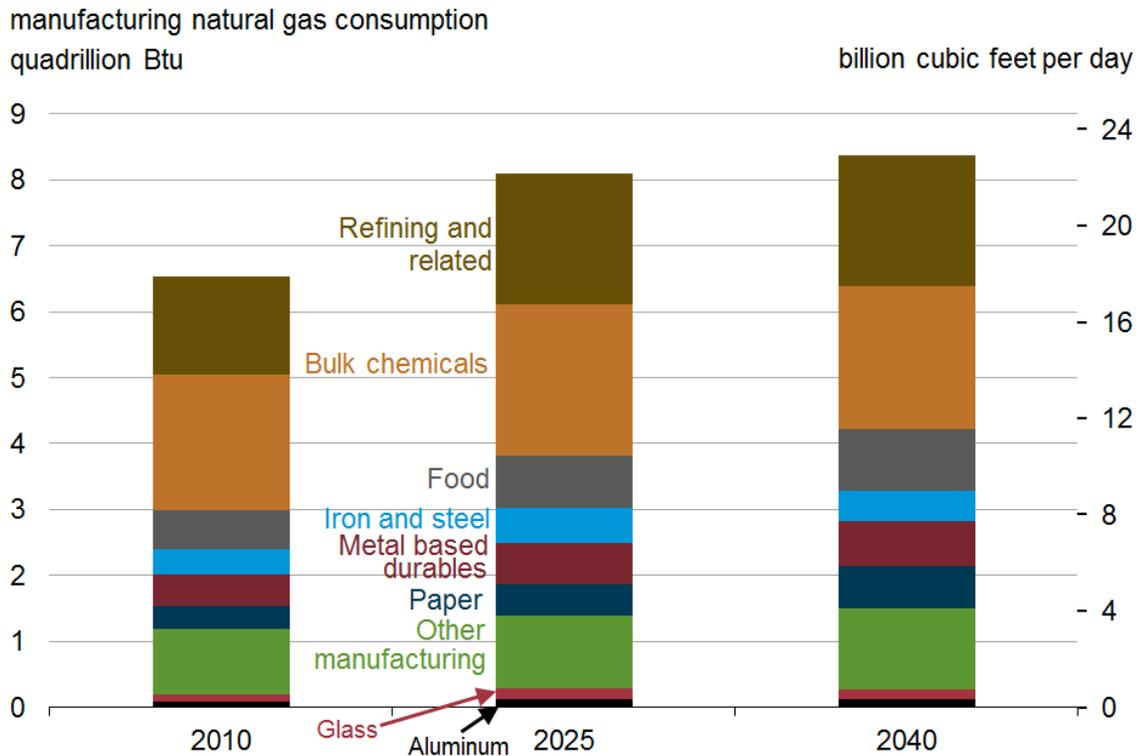
the transportation sector and projected foreign demand for U.S. natural gas exports. A second key uncertainty influencing projected domestic natural gas production relates to the abundance of tight oil and shale gas resources and the pace of technology advances that influence both drilling costs and the recovery factor. The impact of alternative assumptions in these two areas will be explored in *AEO2014* side cases that address high and low oil price scenarios and more optimistic and pessimistic assumptions regarding the resource base and the pace of technology advances. The impacts of revised assumptions and scenarios can be substantial. For example, projected natural gas production in 2040 is roughly 4 Tcf above the Reference case level in the High Oil Price scenario, and roughly 8 Tcf above the Reference case level in the High Oil and Gas Resource case. Projected prices and export levels also differ considerably across these cases.

Average annual U.S. natural gas prices have remained relatively low over the past several years as a result of the availability of abundant domestic resources and the application of improved production technologies. Growth in demand for natural gas, largely from the electric power and industrial sectors (including oil refineries), and for LNG exports, supports higher prices, particularly toward the end of the present decade. To meet that rising demand, producers move into basins where the recovery of natural gas is more difficult and expensive, which leads to an increase in Henry Hub spot prices of 3.7% per year in the Reference case, from \$2.75 per million Btu (MMbtu) in 2012 to \$7.65 per MMBtu (2012 dollars) in 2040.

Energy intensive Industries benefit from shale gas

Availability of natural gas and hydrocarbon gas liquids (HGL) from wet gas production at prices that are attractive relative to those in other regions supports the growth of energy intensive industries that rely on those as both a fuel and as a feedstock in the United States.

Overall, industrial shipments grow at a 3.0% annual rate over the first 10 years of the *AEO2014* Reference case projection and then slow to 1.6% annual growth from 2025 through 2040. Bulk chemicals and metals-based durables account for much of the increased growth in industrial shipments in *AEO2014*. Industrial shipments of bulk chemicals, which benefit from an increased supply of natural gas liquids, grow by 3.4% per year from 2012 to 2025 in *AEO2014*. The higher level of industrial shipments leads to more natural gas consumption in the U.S. industrial sector, increasing from 8.7 quadrillion British thermal units (Btu) in 2012 to 10.6 quadrillion Btu in 2025 in *AEO2014*, compared to 9.8 quadrillion Btu in 2025 in *AEO2013*. Natural gas use in manufacturing, the single largest component of overall industrial gas use, rises rapidly over the next decade. Projected prices for natural gas also make it a very attractive fuel for new generating capacity. In 2040, natural gas accounts for 35% of total electricity generation, while coal accounts for 32%.



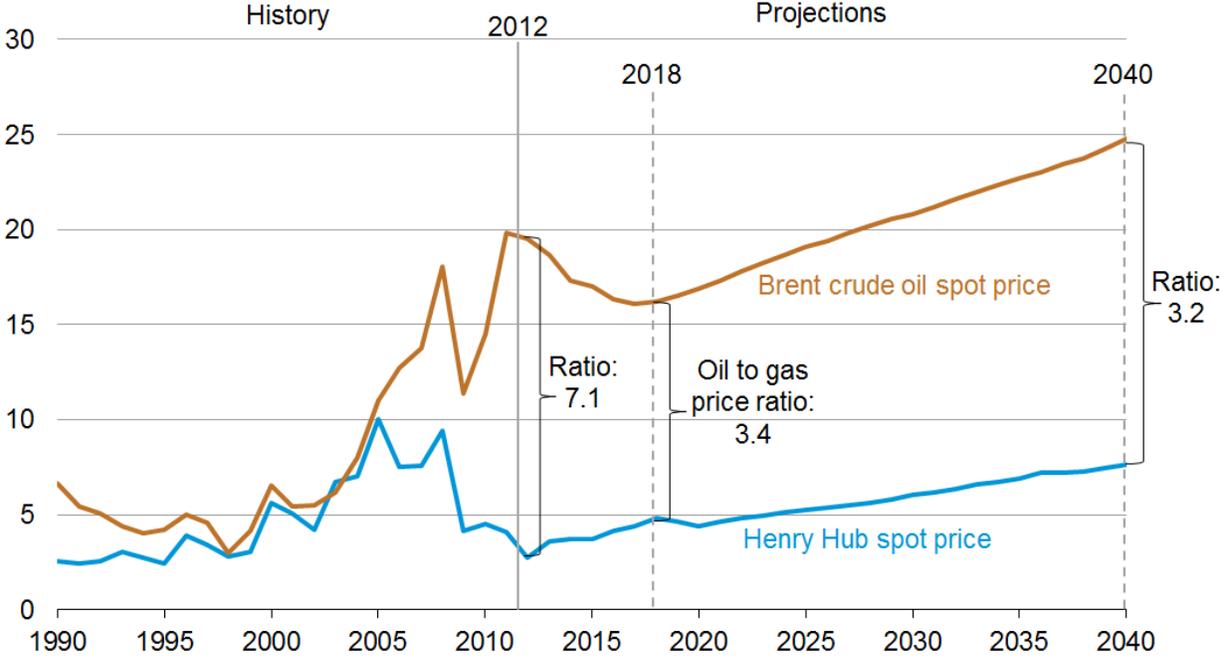
Source: EIA, Annual Energy Outlook 2014, Reference case

Growth in Transportation Demand and Exports

Some of the largest changes in consumption are seen for natural gas consumed in transportation and exported as LNG, since the profitability of natural gas as transportation fuel or as LNG for export depends primarily on the price differential between crude oil and natural gas. Although transportation use currently accounts for only a small portion of total U.S. natural gas consumption, the percentage growth in natural gas demand by heavy-duty vehicles, ships, and trains is significant. Consumption in the transportation sector, excluding natural gas use at compressor stations, grows from about 40 billion cubic feet in 2012 to 850 billion cubic feet in 2040.

energy spot prices

2012 dollars per million Btu

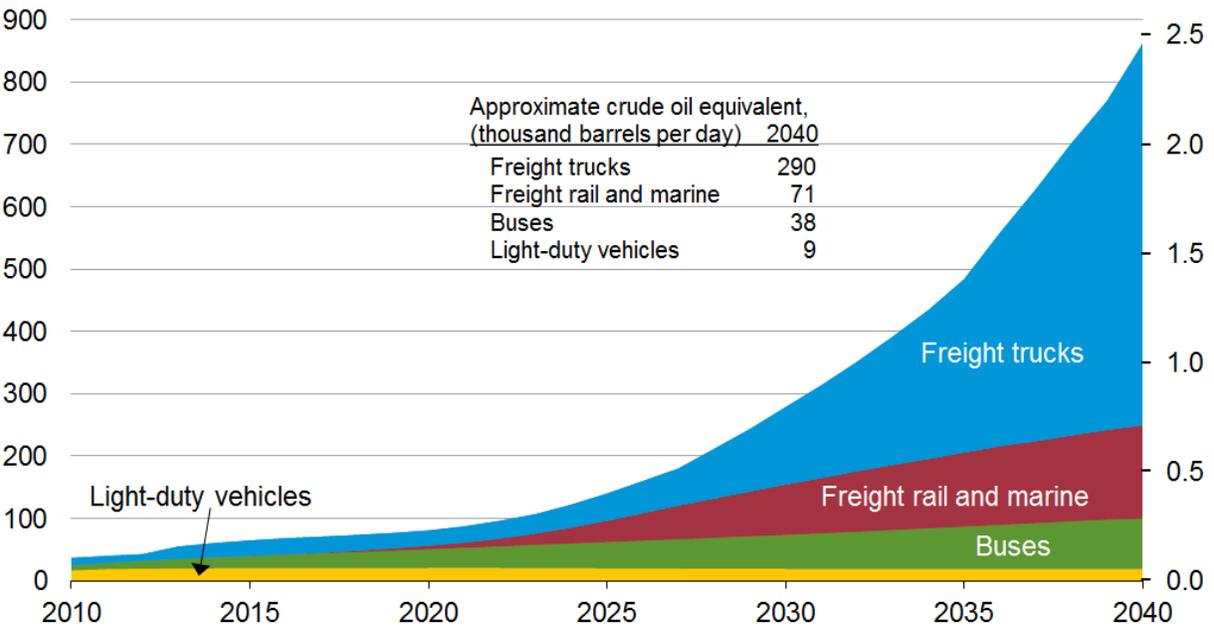


Source: EIA, Annual Energy Outlook 2014, Reference case

natural gas use by mode

trillion Btu

billion cubic feet per day

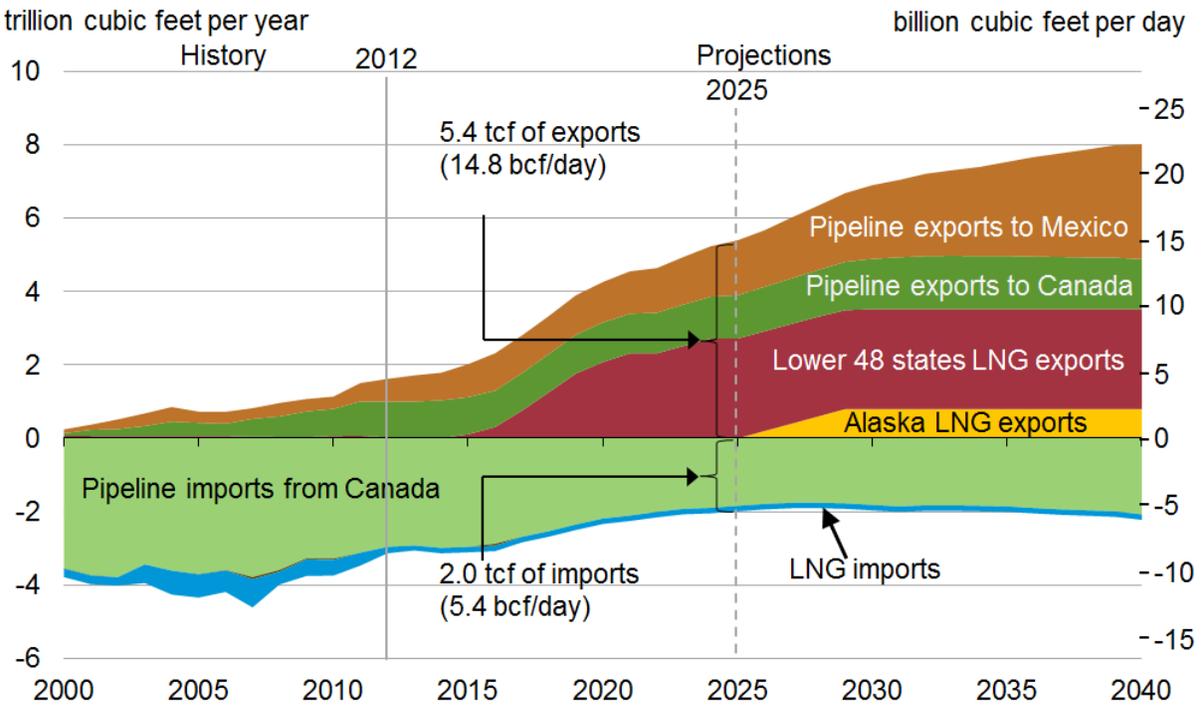


Source: EIA, Annual Energy Outlook 2014, Reference case

U.S. exports of natural gas also increase in the *AEO2014* Reference case. Pipeline exports of U.S. natural gas to Mexico grow by 6% per year, from 0.6 Tcf in 2012 to 3.1 Tcf in 2040. Over the same period, as more U.S. demand is met by domestic production, net pipeline imports from Canada fall to less than 1 Tcf. From 2012 to 2040, U.S. net exports of LNG increase by 3.5 Tcf, including 800 Bcf of LNG originating in Alaska, with the remaining volumes originating from export terminals located along the Atlantic and Gulf coasts. In general, future U.S. LNG exports depend on a number of factors that are difficult to anticipate, including the speed and extent of price convergence in global natural gas markets, the extent to which natural gas competes with oil in U.S. and international gas markets, and the pace of natural gas supply growth outside the United States.

Projected U.S. natural gas exports are sensitive to the abundance of tight oil and shale gas resources, the pace of technology advances that influences drilling costs, the recovery factor, and evolution of global oil prices. While the *AEO2014* side cases are not yet completed, projected LNG exports by 2040 in the High Oil Price case are nearly twice as high as in the Reference case. Projected LNG exports in the High Oil and Gas Resource case, which uses the Reference case oil price scenario but is more optimistic about the size of the resource base and technology advance, fall midway between those in the Reference and High Oil Price cases.

U.S. natural gas imports and exports
trillion cubic feet per year



Source: EIA, Annual Energy Outlook 2014, Reference case

Thank you for the opportunity to testify before the Committee.