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FACTS**



Liquified Natural Gas Use Growing, Improving Air Quality

Among the benefits of increased natural gas production in Pennsylvania and across the country are the growing opportunities for the use of liquified natural gas (LNG) for multiple applications, to the point that the U.S. became the world's largest producer of LNG at the end of last year, according to tracking data compiled by Bloomberg. Some elected officials, most notably Sen. Elizabeth Warren (D-MA), recently criticized the industry for exporting a portion of the natural gas currently being produced domestically in the form of LNG when prices ticked upward as the U.S. approached the winter months.

There is a whole lot more, of course, to the growth of LNG and its uses, both here and abroad. Here are several important facts and positive developments created through the greater use of LNG.

Supply and Demand in 2021

Sen. Warren claimed that "corporate greed" was tied to the export of LNG and the recent increases in domestic natural gas prices, ignoring long-term pricing trends and the fact that U.S. producers need time to supply a rapidly growing post-COVID global economy that resulted in a reduction of new wells and production in 2020. While U.S. prices this winter are expected to remain slightly elevated, the Energy Information Administration and other analysts expect those prices will be closer to \$3.50-\$3.75/MMBtu in spring of 2022. Regardless of recent commodity price trends, the average price of natural gas in 2021 was below the 20-year average of approximately \$5.70 per Mcf.

LNG Exports Growing, Displacing Coal

In the past five years, newly constructed LNG terminals in the U.S. have allowed exports to increase from near zero to 10 Bcfd. Most LNG exports were shipped to Asia in 2021, with the greatest volumes being 13 percent to both South Korea and China and 10 percent to Japan. European countries also received about 37 percent of the total U.S. LNG exports. All told, however, these exports represent only 10 percent of total natural gas production in the U.S.

The demand in Asia and Europe for clean-burning natural gas from the U.S. is expected to remain strong as those countries seek to reduce their dependence on supplies from Russia and reduce carbon emissions from coal-fired power plants. As we have seen in the U.S. with the greater use of natural gas for electricity generation over the past decade, this trend will improve global air quality and decrease CO2 emissions.

Growth of Virtual Pipelines

LNG is also an important piece of the growing market to ship much-needed supplies of natural gas to end users either in areas without access to natural gas service or during periods of high demand. There are several terminals in Pennsylvania with dedicated trains to convert natural gas to LNG and deliver it by truck where and when it is needed most. At the national level, analysts expect a growth in virtual pipelines between 2021-2028 to be at a compounded annual growth rate of about a 6.4 percent.

Marine Fuel Supplies

December 2020 marked a new era in Great Lakes shipping with the first LNG bunkering at a ship docked at the Port of Hamilton, Ontario, using LNG converted by Pivotal LNG from a liquefaction facility in Towanda, Bradford County. While still small in scale, this was viewed as a milestone in the energy evolution of the Great Lakes shipping industry, which is looking for new ways to reduce greenhouse gases.

The transformation of ocean-going vessels around the world to accommodate the use of LNG has also grown, and is seen as a key strategy to support the International Maritime Industry's efforts to reach its goal of reducing greenhouse gases 40 percent by 2030. LNG volume in maritime shipping is expected to increase by 21 percent in 2025 compared to 2019 levels.

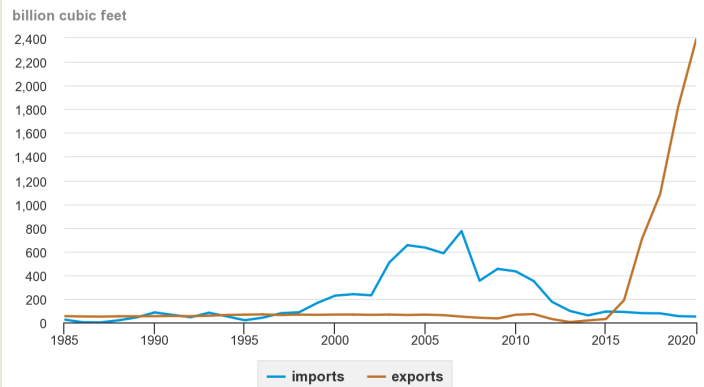
Development of Dual-Fuel Locomotives

The abundance of natural gas in the U.S is also leading to the increased use of LNG for rail transportation across the globe, reducing costs and improving air quality by reducing diesel emissions from locomotives. General Electric estimates its dual-fuel technology can reduce overall energy costs by 50 percent over diesel-only engines.



Pivotal LNG's (pivotallng.com) Pennsylvania facility, located in Wyalusing, Bradford County, went into service in 2021 and produces approximately 50,000 gallons of LNG per day, along with a storage capacity of 180,000 gallons to meet customers' demands quickly and efficiently.

U.S. LNG imports and exports, 1985-2020



Source: U.S. Energy Information Administration, *Natural Gas Monthly*, May 2021

The exponential growth of natural gas production in the U.S. has opened new domestic transportation opportunities for liquified natural gas (LNG), such as virtual pipelines, as well as exports to countries experiencing significant demand and seeking alternatives to natural gas from Russia. At the same time, stalled pipeline projects to key markets in the U.S. have stymied additional usage and driven prices up significantly in regions like the northeast.

The Facts

LNG provides a safe, affordable and clean fuel source in a number of applications, including the export of a small portion of natural gas produced from shale formations in the U.S. Storage capacity around the country and pipeline bottlenecks, most notably to the north and east of the Appalachian Basin, reduce the capability of U.S. producers to directly supply additional gas to those regions and reduce energy costs for businesses and consumers. The greater use of LNG to meet additional domestic and global demand is positive news for the U.S. economy and the global environment.



115 VIP Drive, Suite 210,
Northridge Office Plaza II
Wexford, PA 15090-7906
(724) 933-7306 | Fax (724) 933-7310
www.pioga.org | info@pioga.org