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# Impact Analysis of U.S. Natural Gas Exports on Domestic Natural Gas Pricing

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ENERGY VENTURES ANALYSIS

Prepared by:



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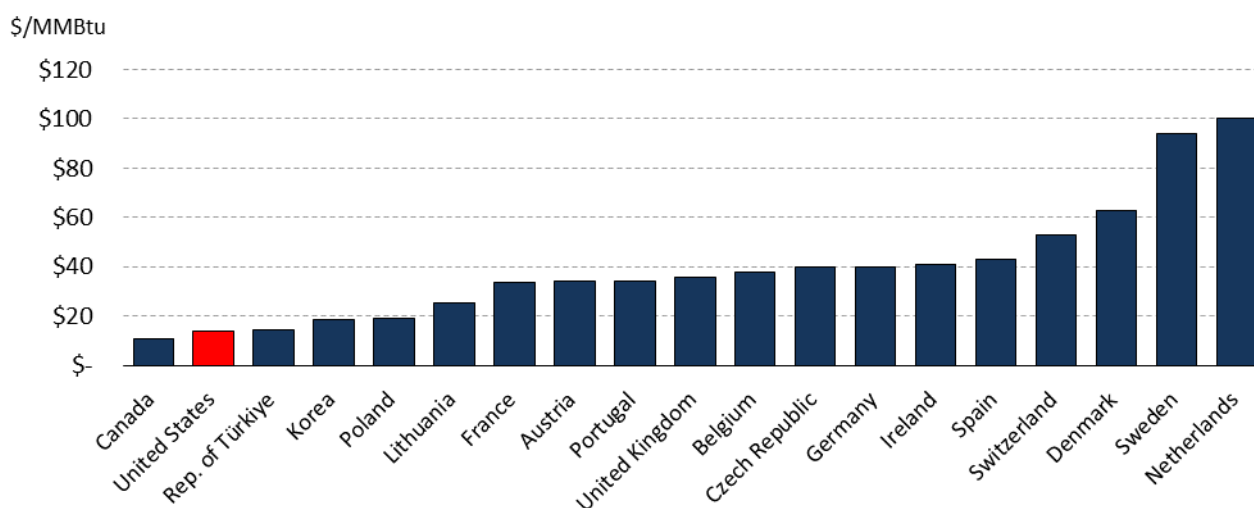
## Key Findings

1. The shale gas revolution resulted in a massive shift in U.S. natural gas supply and demand flows, ringing in a new era of low-cost natural gas supply and turning the U.S. into a global energy superpower.
2. Despite a record level of natural gas exports during the first six months of 2023, U.S. natural gas prices at Henry Hub averaged \$2.48 per MMBtu, the lowest six-month average in over 35 years (outside of the COVID-19 pandemic).
3. Unique post-COVID-19 pandemic circumstances and U.S. coal market exposure to global markets—not U.S. LNG exports—were the primary factors behind domestic natural gas prices briefly increasing to 14-year highs in 2022.
4. Virtually unchanged LNG export terminal utilization from 2021 to 2023 and the substantial disconnect between domestic and international natural gas prices further highlight U.S. natural gas exports' minimal impact on domestic natural gas pricing.
5. Completion of U.S. LNG export terminals has had minimal impact on short-term domestic natural gas pricing due to their lengthy construction times as well as unique long-term financing and contracting structure.
6. Increased U.S. natural gas exports have and will continue to create massive economic benefits for U.S. communities while providing global access to the reliable U.S. natural gas supply needed to further the global energy transition from higher greenhouse gas (GHG) emitting fuels to lower-GHG emitting natural gas.
7. Restricting natural gas infrastructure development will impede continued access to low-cost natural gas supply, regardless of U.S. LNG export levels.

## Executive Summary

Over the last 15 years, the U.S. energy sector has undergone one of the most dramatic transformations in its history. The cost-effective combination of hydraulic fracturing and horizontal drilling enabled the economical exploration of previously inaccessible or cost-prohibitive natural gas and oil reserves across the United States. The increased low-cost supply base of both oil and natural gas ushered in the shale gas revolution around 2007. Since then, natural gas and oil production in shale plays has grown substantially, allowing the U.S. to become a net exporter of both natural gas and oil over the last six years. In 2023, the U.S. became the world's largest liquefied natural gas (LNG) exporter. Despite U.S. natural gas exports and domestic consumption reaching all-time highs in recent years, domestic residential natural gas prices remained among the lowest in the world. These trends illustrate that upstream production of America's abundant natural gas resources continues to effectively deliver affordable supplies in response to changing market conditions. Put simply, growing demand begets growing supply.

### EXHIBIT ES-1: 2022 AVERAGE RESIDENTIAL NATURAL GAS PRICES BY COUNTRY



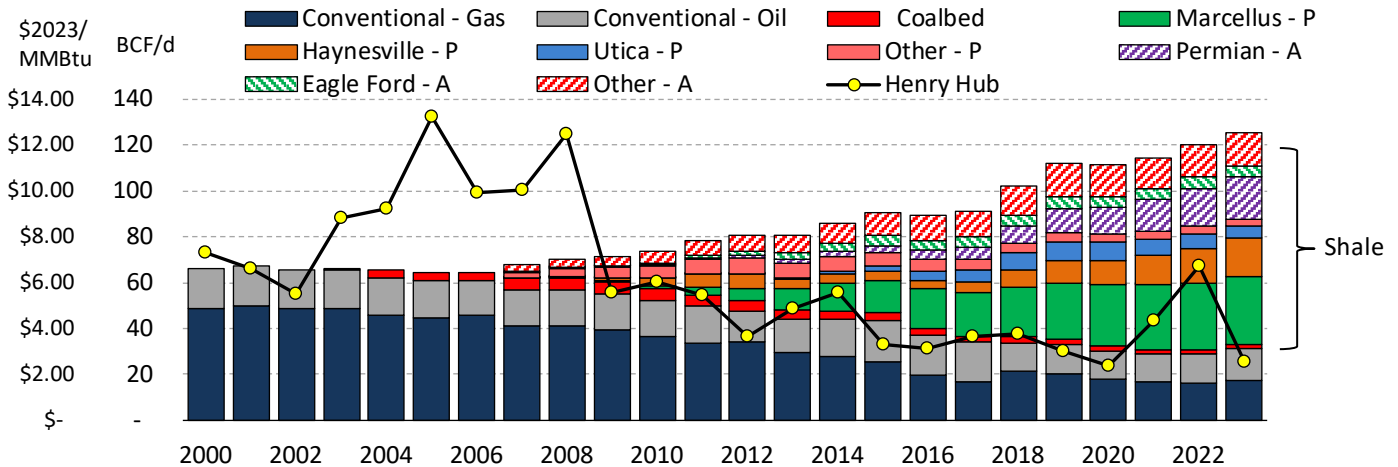
Source: IEA data

As the United States has risen to lead the world in LNG exports, critics of expanded export capacity have argued that this growth has increased financial burdens on U.S. natural gas consumers. In making this case, anti-export advocates point to the substantial rise in U.S. natural gas prices in 2022. This report provides an assessment of changes in the U.S. natural gas industry, essential context to the natural gas pricing anomaly of 2022, and a review of domestic and global benefits to U.S. natural gas exports.

Key findings of the report include:

- The shale gas revolution resulted in a massive shift in U.S. natural gas supply and demand flows, ringing in a new era of low-cost natural gas supply and turning the U.S. into a global energy superpower.** Between 2007 and 2022, U.S. gross natural gas production from shale plays grew from virtually non-existent volumes to almost 90 billion cubic feet per day (BCF/d). Low-cost natural gas production from shale plays increased the U.S. total natural gas production and displaced higher-cost production from conventional natural gas and oil wells. The increased low-cost supply base of natural gas and oil enabled the United States to export more natural gas, crude oil, and petroleum products than it imported for the first time in its history. Natural gas prices at Henry Hub have averaged roughly \$4.10/MMBtu for the last ten years, a reduction of more than 54% compared to the prior decade.

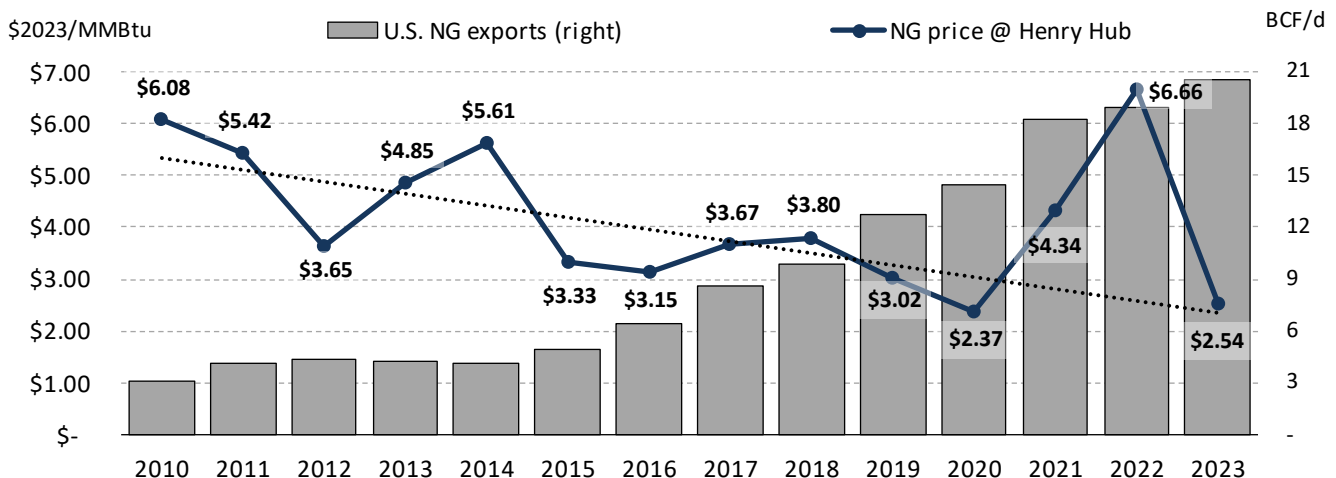
EXHIBIT ES-2: ANNUAL U.S. NATURAL GAS PRODUCTION VERSUS NATURAL GAS PRICES AT HENRY HUB



Source: EIA data; P - pure gas play; A - associated gas/primary oil play

- Despite a record level of natural gas exports during the first six months of 2023, U.S. natural gas prices at Henry Hub averaged \$2.48 per MMBtu, the lowest six-month average in over 35 years (outside of the COVID-19 pandemic).** The shale gas revolution and subsequent rise in Appalachian natural gas production massively changed the flow of the commodity across the U.S. natural gas pipeline network, increasing the amount of natural gas “trapped” in the South Central region. To take advantage of the surplus of natural gas in the region, U.S. companies developed new LNG export terminals along the Gulf and East coasts. Since the first LNG export terminal became operational in 2016, the U.S. has become the largest LNG exporter in the world, providing access to the U.S. low-cost natural gas while bringing massive economic benefits to the U.S. economy as a whole. Over the last 15 years, any substantial increase in natural gas demand from the industrial, electric power, or export sectors has been accompanied by a corresponding increase in U.S. natural gas production. For example, while LNG exports rose by roughly 14 Bcf/d between 2016 and 2023, dry gas production jumped by 31 Bcf/d. Despite total U.S. natural gas consumption almost doubling from 2010 to 2023, the 2023 average natural gas price of \$2.54 per MMBtu was the second-lowest level in over 35 years, only exceeding 2020 COVID-19 pandemic lows by a few cents.

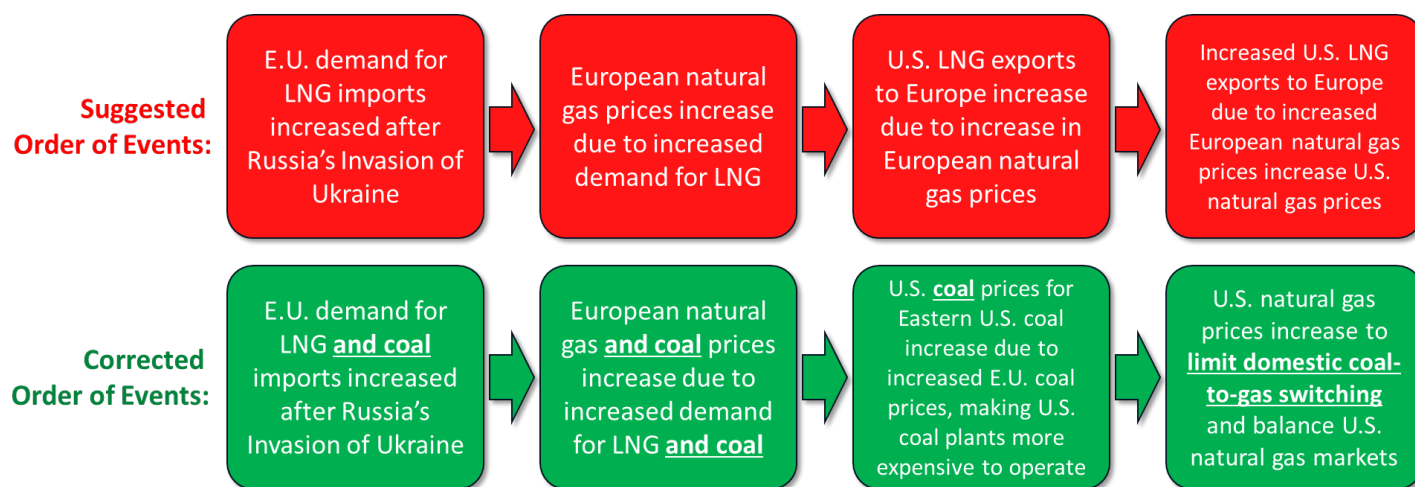
EXHIBIT ES-3: ANNUAL U.S. NATURAL GAS EXPORTS VERSUS NATURAL GAS PRICES AT HENRY HUB



Source: EIA data; Note: trendline excludes 2022

- **Unique post-COVID-19 pandemic circumstances and U.S. coal market exposure to global markets—not U.S. LNG exports—were the primary factors behind domestic natural gas prices increasing to 14-year highs in 2022.** As domestic demand for energy commodities (i.e., coal, natural gas, and oil) returned during the summer of 2021, domestic production responded more slowly, due to issues such as supply chain challenges, increased corporate debt and a national labor shortage, causing fossil fuel inventories to dwindle rapidly. After Russia’s February 2022 invasion of Ukraine upended the energy supply-demand balance in Europe, global coal and (albeit much later) natural gas prices rose to incentivize non-Russian imports into Europe. Due to the limited supply growth in the U.S. coal market, domestic coal prices rose rapidly, changing the relative economics of coal- and gas-fired power generators and causing increased amounts of natural gas to be consumed in the domestic power sector. Moreover, due to below-average domestic natural gas inventory levels, domestic natural gas prices then rose to match domestic coal prices, limiting additional coal-to-gas generation shifting in the power sector.
- **The virtually unchanged LNG export terminal utilization from 2021 to 2023 (EXHIBIT 24) and the substantial disconnect between domestic and international natural gas prices (EXHIBIT 25) further highlight U.S. natural gas exports’ minimal impact on domestic natural gas pricing.** Further, in 2022, the U.S. electric power sector accounted for the largest year-over-year increase in natural gas consumption – nearly three times as much as the increase in natural gas exports.

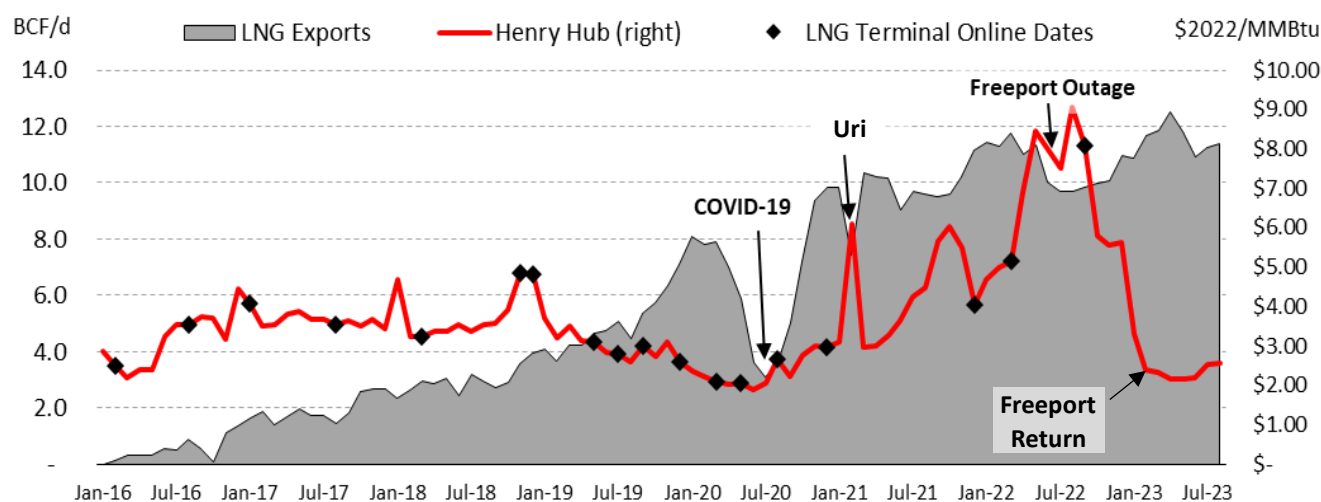
**EXHIBIT ES-4: CORRECTED ORDER OF EVENTS OF 2022 U.S. NATURAL GAS PRICE ANOMALY**



- **Completion of U.S. LNG export terminals has had minimal impact on short-term domestic natural gas pricing due to their lengthy construction times as well as unique long-term financing and contracting structure.** Due to their multi-year permitting and construction lead time, U.S. LNG export terminals must enter into long-term export contracts with off-takers for the majority of their capacity to ensure the financial viability of these multi-billion-dollar infrastructure projects. The lengthy project development process gives U.S. natural gas producers sufficient time to increase output to feed the new LNG export projects. As a result, the U.S. natural gas market already has accounted for the increased demand from a new LNG export terminal by the time the project is completed and loads its first vessel. Also, due to the long-term contracting nature for most of the scheduled LNG export volumes, the nominal natural gas flows to the new terminal are highly predictable and, therefore, priced into the U.S. natural gas market, resulting in little to no increase in domestic natural gas prices. However, unexpected losses of LNG flows can result in a sudden drop in natural gas prices, as shown by the Freeport LNG

incident and subsequent outage in the summer of 2022. Since natural gas is delivered on a continuous basis via pipelines, the unexpected loss of demand due to the Freeport LNG outage resulted in a substantial natural gas supply-demand market imbalance until the U.S. electric power sector absorbed the excess supply, returning domestic natural gas prices to pre-Freeport LNG outage levels. However, when Freeport returned to operation in February 2023, domestic natural gas prices were virtually unaffected, despite the 2.1 BCF/d increase in demand due to its predictable nature. This phenomenon is not unique to the LNG sector and can occur regardless of the source of demand.

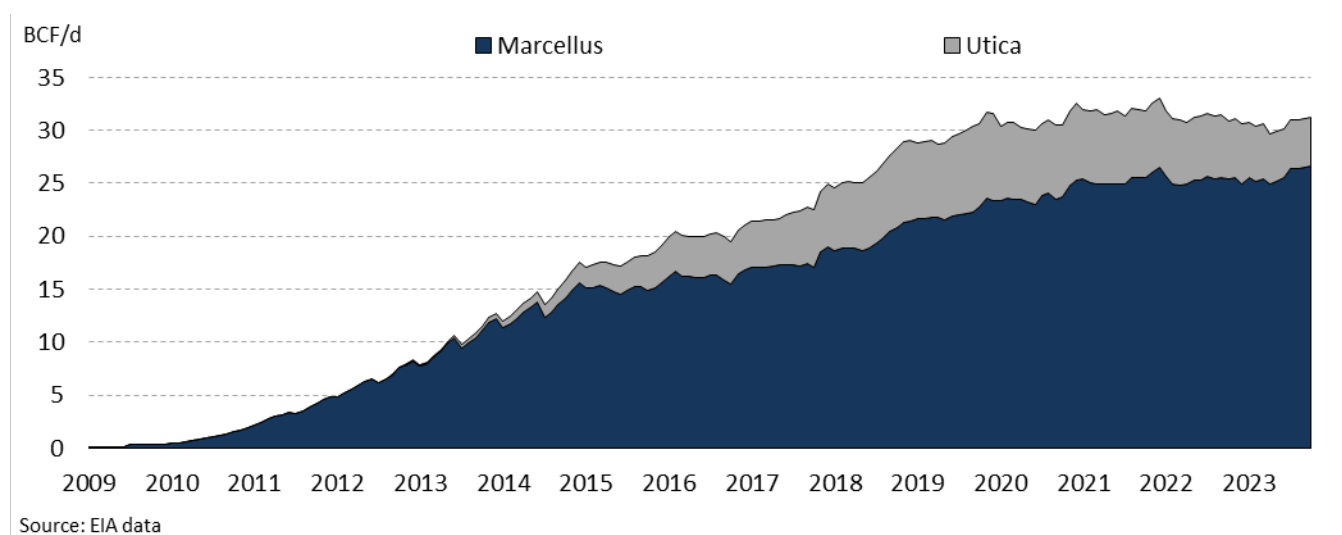
**EXHIBIT ES-5: U.S. LNG EXPORTS & TERMINAL COMPLETION DATES VS. NATURAL GAS PRICES AT HENRY HUB**



Source: EIA data

- Increased U.S. natural gas exports have and will continue to create massive economic benefits for U.S. communities while providing global access to the reliable U.S. natural gas supply needed to further the global energy transition from higher greenhouse gas (GHG) emitting fuels to lower-GHG emitting natural gas.** The strong growth in U.S. natural gas production, transportation, and exports has brought substantial economic prosperity to regions (Haynesville, Permian, Bakken, Appalachia) previously known for high unemployment rates and low economic activity, benefitting local U.S. communities through royalty and tax payments, while increasing local employment. Increased U.S. natural gas exports will also allow for increased beneficial use of the fuel abroad as previously trapped natural gas will find its way into the global natural gas market. Access to U.S. natural gas also allows other countries to accelerate their transition away from coal, which was consumed at a record-setting level of 8.3 billion tonnes in 2022, to natural gas and renewables, reducing global GHG emissions while the economic benefits remain with U.S. communities.

- **Restricting natural gas infrastructure development will impede continued access to low-cost natural gas supply, regardless of U.S. LNG export levels.** In an LNG analysis conducted as part of its 2023 Annual Energy Outlook,<sup>1</sup> the U.S. Energy Information Administration (EIA) found that the continued expansion of U.S. natural gas infrastructure (e.g., gathering, lateral, intra, and interstate pipelines) was key to ensuring continued access to low-cost natural gas supply. Over the last few years, opposition by environmental groups and certain states toward new natural gas pipeline projects has slowed U.S. natural gas supply growth, especially in the Appalachian region, where natural gas production has not grown since late 2020 (**Exhibit ES-6**). This lack of sufficient pipeline takeaway capacity has resulted in increased volatility in domestic natural gas prices. Limiting the expansion of pipeline takeaway capacity will also limit future access to low-cost natural gas supply when current resources are depleted. Therefore, increased U.S. natural gas exports will encourage ongoing and future investment by U.S. companies in the natural gas supply, transportation, and storage infrastructure needed to enable continued domestic and abroad access to one of the world's lowest-cost natural gas supplies.

**EXHIBIT ES-6: MONTHLY NATURAL GAS PRODUCTION IN THE APPALACHIAN REGION**

<sup>1</sup> [https://www.eia.gov/outlooks/aeo/IIF\\_LNG/](https://www.eia.gov/outlooks/aeo/IIF_LNG/)