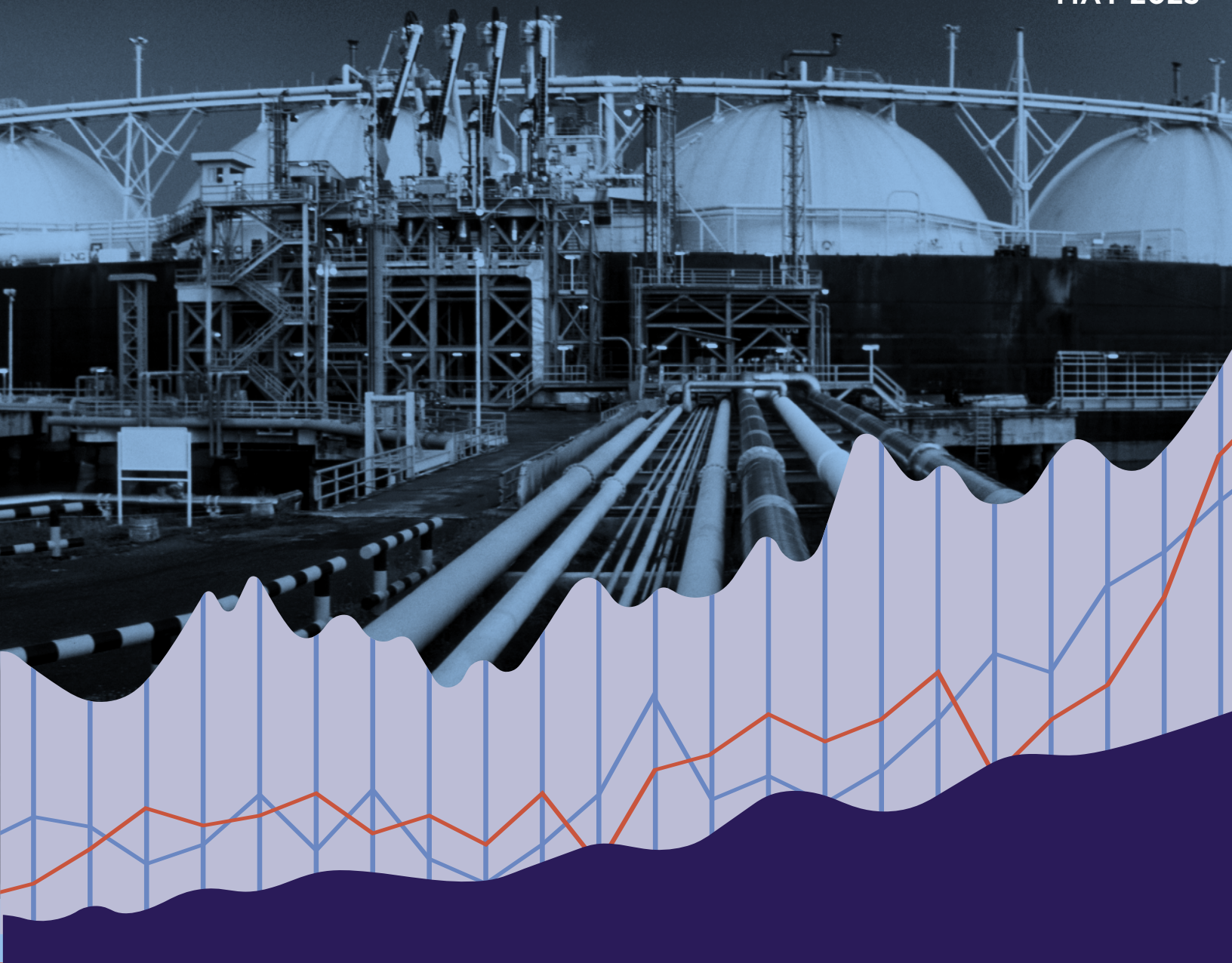


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# Analysis of U.S. Natural Gas Market Price Impacts from Increasing Natural Gas Supply Accessibility for Different Natural Gas Demand Outlooks

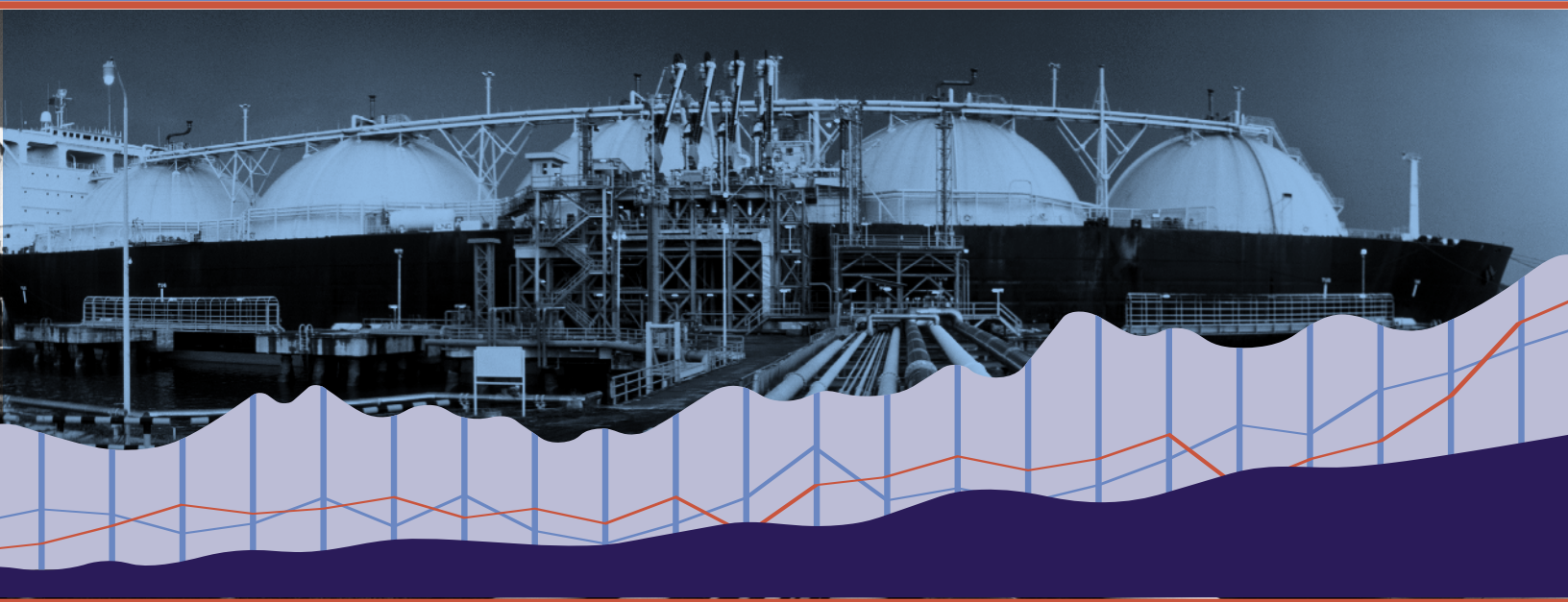
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# Analysis of U.S. Natural Gas Market Price Impacts from Increasing Natural Gas Supply Accessibility for Different Natural Gas Demand Outlooks

*Recent global economic turmoil brought about by recent health and geo-political crises, such as the Covid-19 pandemic and the Ukraine-Russia war, has once again put the spotlight on U.S. energy markets, renewing calls for limiting U.S. energy exports among some policy makers who fear rising domestic prices. Given this concern, the American Council for Capital Formation commissioned NERA Economic Consulting to evaluate the potential natural gas market price impacts of increasing natural gas supply accessibility for various demand (U.S. LNG exports and domestic demand) outlooks. Several prior studies have shown that increases in U.S. LNG export levels have resulted in macroeconomics benefits to the U.S. economy and are associated only with modest increases in domestic natural gas prices. This study confirms previous analyses and concludes that the U.S. will continue to have sufficient natural gas resources to satisfy both growing domestic consumption and export demand at relatively low prices, and that the lack of new pipeline infrastructure is a material impediment to the natural gas industry bringing the lowest cost gas resources to the market.*

<sup>1</sup> This special report is a condensed summary of the full report by NERA Economic Consulting. For a full explanation of the topics discussed and references, please refer to the [full report](#).

## I. INTRODUCTION AND BACKGROUND

Fifteen years ago, the prevailing wisdom was that the U.S. would continue to be an importer of natural gas to satisfy domestic demand with increasing prices over time. However, with estimates of proven resources increasing year-over-year, U.S. natural gas production has experienced tremendous growth. The continued optimism towards shale gas potential and accelerated recovery due to advancements in hydraulic fracturing and horizontal drilling techniques resulted in a low and sustained natural gas price environment for more than a decade.

With the decreasing full-cycle cost of shale gas production, the U.S. became a net exporter of natural gas in 2017, buoyed by the exports of LNG. Natural gas production has increased by an average annual growth rate of about 3% over the past decade. In 2021, the U.S. exported a record high of about 9.8 Bcf/day of LNG. As of mid-2022, the U.S. had the highest LNG export capacity in the world and averaged 11.2 Bcf/day of LNG exports in the first half of 2022.

However, natural gas prices have become more volatile and reached record high levels in early 2022 as a result of pent-up demand coming out of COVID-19, imbalances in the storage levels, and global natural gas market disruptions arising from geo-political events.

The volatility in gas prices renewed calls for limiting U.S. exports among some policy makers. However, several prior studies have shown that increases in U.S. LNG exports led to greater U.S. natural gas production, demonstrating the substantial potential of U.S. natural gas resources that can be tapped into provided producers have access to bring natural gas to market. (Please see **Table 1** for a detailed summary of prior studies.) These studies also concluded that increases in U.S. LNG export levels are associated with only modest increases in domestic natural gas prices.

Given the significant changes in the global economy and energy markets, the ACCF asked NERA Economic Consulting to evaluate how U.S. natural gas market prices could be impacted by increasing natural gas supply accessibility for various demand outlooks with different levels of U.S. LNG exports and domestic demand.

## II. U.S. NATURAL GAS MARKET IMPACT ASSESSMENT APPROACH

A partial equilibrium approach is used to examine natural gas price reductions from increasing accessible supply by expanding the availability of pipeline infrastructure in the U.S. under different demand outlooks. The supply regions analyzed in this study are based on the regions in EIA's Natural Gas Market Module which models the transmission, distribution, and pricing of natural gas in their National Energy Modeling System (NEMS). Specifically, it analyzes 9 natural gas supply regions including: East, West Coast, Rocky Mountain, Midcontinent, Southwest, Gulf Coast, Gulf, Northern Great Plains and Pacific. The availability of natural gas supply for each region is calculated using inter-state and intra-state pipeline capacity for that region and assumptions relating to pipeline capacity utilization.

The study takes into account natural gas supplies to both the domestic market, where natural gas is supplied to satisfy regional demand, and the export market, where natural gas is supplied to meet natural gas export demand, both for pipeline exports from the U.S. to Canada and Mexico and for LNG exports. The export supply market is based on pipeline capacity from the different supply regions to Canada and Mexico and pipeline capacity from various supply regions to the states in the U.S. where LNG export terminals are primarily located (Texas, Louisiana).

Two different supply outlooks are created in this study to represent different levels of accessibility of natural gas. In addition, numerous demand cases were evaluated.

**Table 1.** Studies on the Effects of U.S. LNG Exports on the U.S. Economy and Domestic Energy Markets

Date	Study/Link	by	Key Results
2011	<b><u>Made in America: The economic impact of LNG exports from the United States</u></b>	The Deloitte Center for Energy Solutions and Deloitte MarketPoint LLC	<ul style="list-style-type: none"> <li>The study projected the weighted-average price impact to be \$0.12/MMBtu on U.S. prices from 2016 to 2035 as a result of an incremental 6 Bcf/day of LNG exports, with the \$0.12/MMBtu representing a 1.7% increase in the projected average U.S. city gate price of \$7.09/MMBtu during this period.</li> </ul>
January 2012	<b><u>Effect of Increased Natural Gas Exports on Domestic Energy Markets</u></b>	EIA	<ul style="list-style-type: none"> <li>Increased natural gas production accounted for about 60 to 70% of natural gas export volumes, with some minor additional contribution from increased exports across Canada.</li> </ul>
December 2012	<b><u>Macroeconomic Impacts of LNG Exports from the United States</u></b>	NERA Economic Consulting	<ul style="list-style-type: none"> <li>In the long-run, natural gas producers could overcome drilling constraints and other limitations and that by 2035, the increase in natural gas production accounted for about 60% of the LNG export volumes compared to about 30 to 40% in 2015.</li> <li>LNG exports would not drive the price of domestic natural gas to levels observed in countries around the world that were willing to pay oil parity-based prices for LNG imports.</li> </ul>
May 2013	<b><u>U.S. LNG Exports: Impacts on Energy Markets and the Economy</u></b>	ICF International	<ul style="list-style-type: none"> <li>The study found that the majority of the incremental LNG exports (79% to 88%) are offset by increased domestic natural gas production with only about 21% to 27% stemming from a decrease in domestic natural gas demand.</li> <li>The average increase in wholesale natural gas price over the 2016-2035 period is projected to be between \$0.32 and \$1.02/MMBtu and between \$0.10 to \$0.11/MMBtu on a per Bcf/day basis.</li> </ul>
October 2014	<b><u>Effect of Increased Levels of Liquefied Natural Gas Exports on U.S. Energy Markets</u></b>	EIA	<ul style="list-style-type: none"> <li>Across the different export scenarios and baselines, higher natural gas production satisfies about 61% to 84% of the increase in natural gas demand from LNG exports, with a minor additional contribution from increased imports from Canada.</li> <li>The average natural gas prices in the lower-48 states projected to be 4% to 11% higher over the 2015-2040 period in the 12 Bcf/day and 20 Bcf/day export cases respectively, relative to the reference case baseline.</li> </ul>
October 2015	<b><u>The Macroeconomic Impact of Increasing U.S. LNG Exports</u></b>	Rice University and Oxford Economics	<ul style="list-style-type: none"> <li>Greater volumes of LNG exports support the long-term expansion of U.S. production with domestic production continuing to increase throughout the time horizon when LNG export volumes increase to 20 Bcf/day from 12 Bcf/day.</li> <li>The majority of the increase in LNG exports are accommodated by expanded domestic production rather than reductions in domestic demand.</li> <li>The study also projected Henry Hub natural gas prices to average between 2.6% to 7.5% higher compared to when the U.S. LNG exports are 12 Bcf/day.</li> </ul>
June 2018	<b><u>Macroeconomic Outcomes of Market Determined Levels of U.S. LNG Exports</u></b>	NERA Economic Consulting	<ul style="list-style-type: none"> <li>To support higher LNG exports, natural gas production grows more rapidly in all scenarios than in the scenarios with lower exports.</li> <li>The average natural gas prices in the lower-48 states to be 4% to 11% higher over the 2015-2040 period in the 12 Bcf/day and 20 Bcf/day export cases respectively, relative to the reference case baseline.</li> </ul>

**i. Supply Cases:** The supply cases evaluated are based on varying pipeline capacity availability to supply to the domestic and the export markets with the cases employing a wide range of assumptions for natural gas pipeline capacity and capacity utilization. The accessible supply curves under two different supply outlooks are consistently constructed from the corresponding unconstrained supply curves, see **Figure-1** and **Figure-2**.

- *Restrictive Accessible Supply:* Natural gas supply to the domestic and export supply markets is based on *current and under construction pipeline capacity* in the U.S. and historical maximum capacity utilization assumptions.
- *Expanded Accessible Supply:* Natural gas supply to the domestic and export supply markets is based on current, under construction and planned pipeline capacity in the U.S. with capacity utilization assumed to be equal to 80% for all inter-state and intra-state pipeline legs. This case assumes that the pipeline operators will not be bound by the historical pipeline capacity utilization levels and will increase capacity utilization on the pipelines to support high levels of export demand.

**ii. Demand Cases:** The demand cases evaluated represent varying levels of projected domestic natural gas consumption, pipeline and LNG natural gas exports.

- *Reference:* The domestic natural gas consumption, pipeline transportation infrastructure, natural gas exports and LNG exports for this scenario are drawn from the EIA's AEO 2022 Reference Case. This case incorporates current laws and regulations enacted as of November 2021.

- *High U.S. Domestic Gas Demand:* This case is based on the side analysis from the AEO 2022 that has the highest projected domestic natural gas consumption due to more accessible resources and lower extraction technology costs than the AEO 2022 Reference Case and thereby projecting higher levels of domestic natural gas consumption, pipeline natural gas exports and U.S. LNG exports.

- *NERA-Most Likely U.S. LNG Exports:* The domestic natural gas consumption, pipeline natural gas exports and LNG exports from the U.S. for this case are drawn from the scenarios that comprise the upper end of the "More Likely" range of LNG export scenarios from NERA's 2018 LNG export study in 2025 and 2035.

- *European Supply Diversification:* Under this case, it is assumed that the deficit in natural gas supplies to Europe brought on by the curtailment in Russian natural gas pipeline imports is partially made up by LNG exports from the U.S. to Europe. The projected level of U.S. LNG exports to Europe are determined using projected regasification capacity, the historical maximum capacity utilization of regasification facilities in Europe and the historical share of U.S. LNG exports into Europe compared to total European LNG imports. In this scenario, it is assumed that the domestic natural gas consumption and pipeline natural gas exports from the U.S. are the same as that in the AEO 2022 Reference case.

**Table 2** outlines the combinations of the supply and demand cases for the eight scenarios analyzed for this study.

**Table 2:** Supply and Demand Scenarios Analyzed

Supply Case	Demand Case
Restrictive Accessible Supply	Reference High U.S. Domestic Demand NERA Most Likely U.S. LNG Exports European Supply Diversification
Expanded Accessible Supply	Reference High U.S. Domestic Demand NERA Most Likely U.S. LNG Exports European Supply Diversification

**Table 3:** Natural Gas Price Impacts from Increasing Supply Accessibility (\$2021/MMBtu)

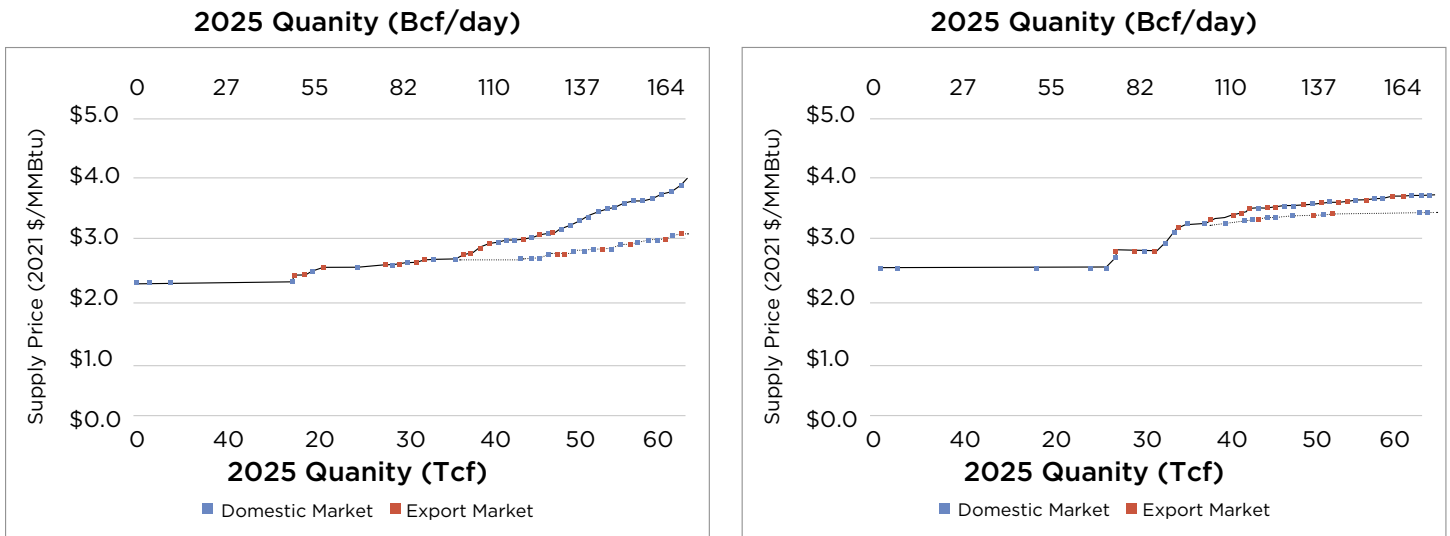
		Supply Cases		
Year	Demand Cases	Restrictive Accessible Supply	Expanded Accessible Supply	Change in Prices
<b>2025</b>	Reference	\$2.90	\$2.65	-\$0.25
	High U.S. Domestic Demand	\$2.90	\$2.65	-\$0.25
	NERA Most Likely U.S.LNG Exports	\$2.95	\$2.70	-\$0.25
	European Supply Diversification	\$3.00	\$2.75	-\$0.25
<b>2035</b>	Reference	\$3.60	\$3.35	-\$0.25
	High U.S. Domestic Demand	\$3.65	\$3.35	-\$0.30
	NERA Most Likely U.S.LNG Exports	\$3.80	\$3.40	-\$0.40
	European Supply Diversification	\$3.70	\$3.35	-\$0.35

### III. RESULTS

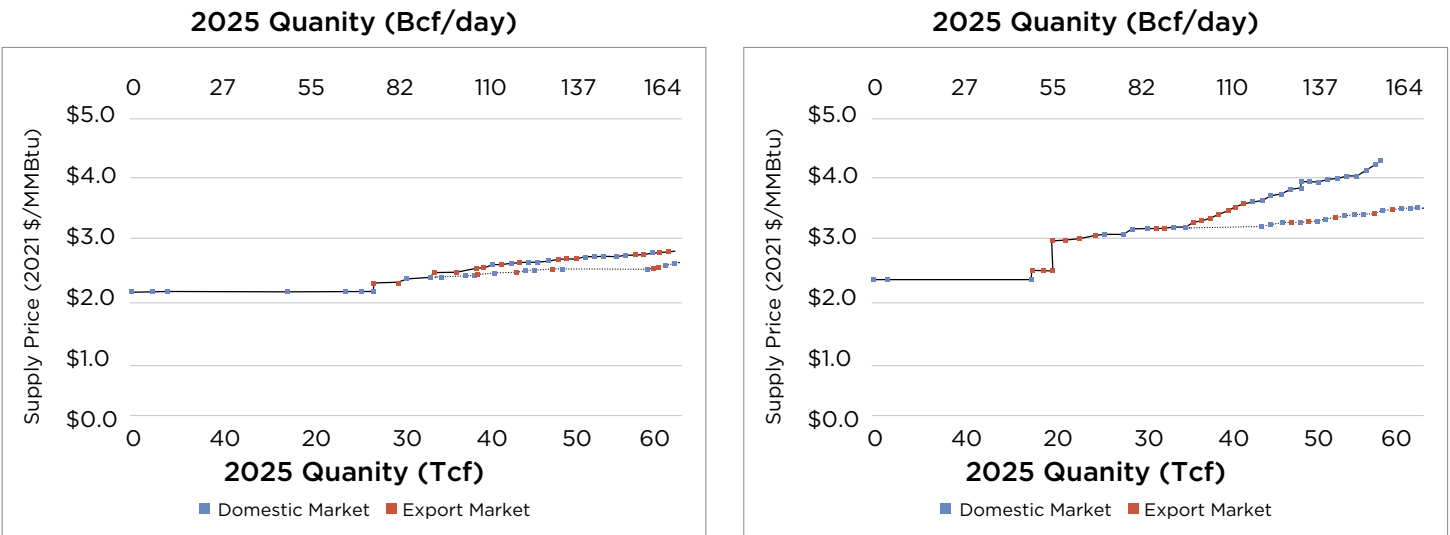
The results of the study reinforce the conclusions regarding the impact of LNG exports on U.S. natural gas prices from prior studies, including NERA’s 2012 and 2018 studies for the U.S. Department of Energy (DOE). Based on the supply and demand analysis, **Table 3** shows the equilibrium natural gas market prices for the two supply cases and four primary demand cases as well as the price differences between the two supply cases for 2025 and 2035 across the various demand cases. These price differences illustrate the lower natural gas prices achievable from increasing pipeline infrastruc-

turability (as in the Expanded Accessible Supply case). In 2025, natural gas prices are projected to be lower by \$0.25/MMBtu to \$0.30/MMBtu while in 2035, they are projected to be lower by \$0.25/MMBtu to \$0.40/MMBtu across the various scenarios analyzed from increasing natural gas accessibility. The results show that without an increase in capacity utilization on existing pipelines or additional new pipelines being built, the equilibrium market prices would be higher up the supply curve resulting in greater price impacts. By increasing accessibility of supply, the same volume of demand could be available at a lower equilibrium price. The equilibrium price is lower under the Expanded Accessible Supply

**Figure-1: Unconstrained and Accessible Supply Curves with Restrictive Supply Assumptions**



**Figure-2: Unconstrained and Accessible Supply Curves with Expanded Supply Assumptions**



case for all the demand cases. Among the various scenarios analyzed, the largest price impacts in 2025 are seen in the European Supply Diversification demand case, where the impacts are about 10%, while in 2035 the largest price impacts are projected to occur in the NERA-Most Likely U.S. LNG Exports demand case where the impacts are also about 10%. The analysis also illustrates that if more pipeline infrastructure could be built, especially in the intra marginal supply source regions, the supply curve could be extended outwards allowing for low-cost volumes to be available for domestic consumption or exports.

### The key take aways from the study:

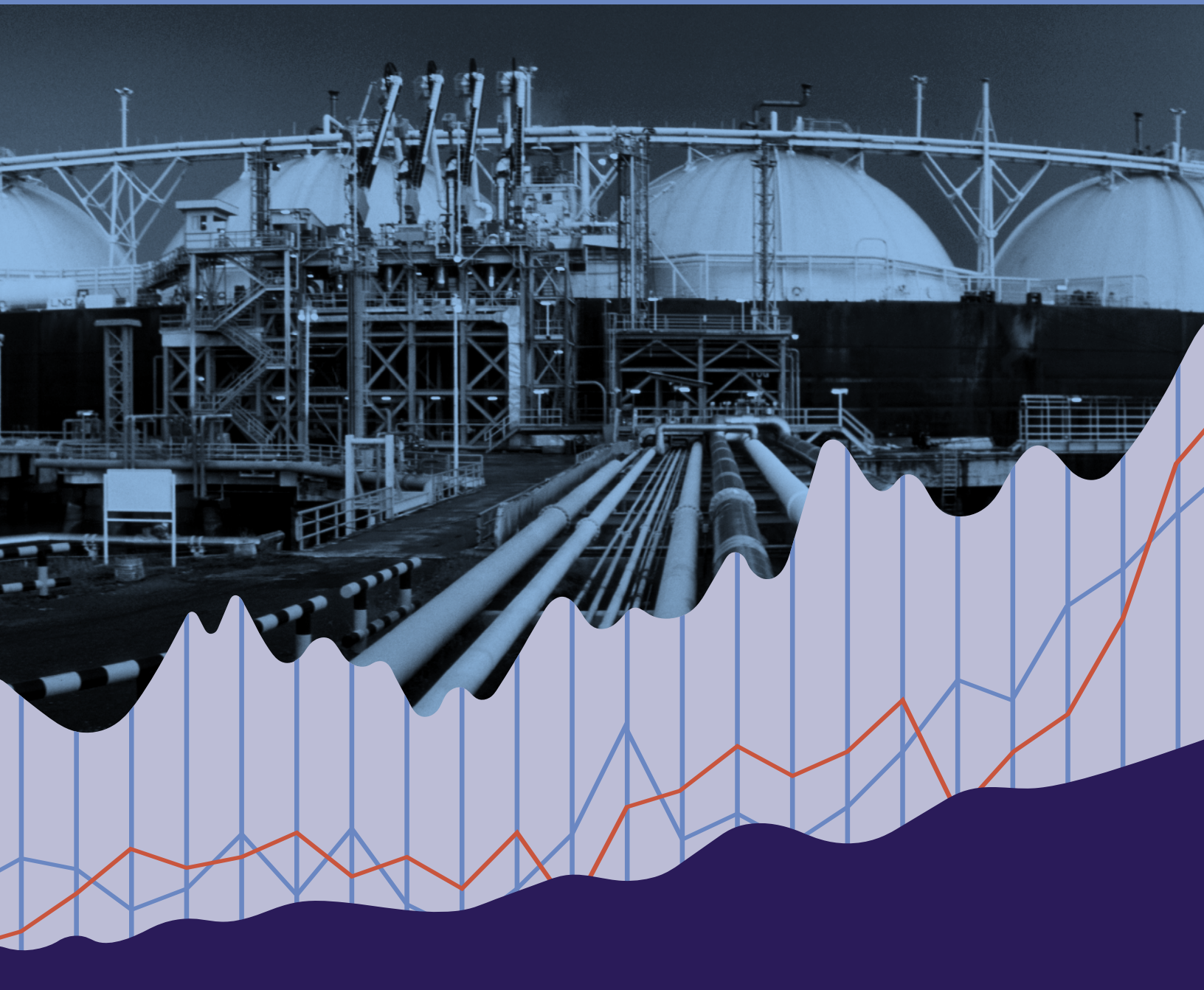
- *The U.S. continues to have sufficient natural gas resources to meet growing market needs at relatively low prices.* An analysis of the U.S. EIA's estimates of technically recoverable resources of dry natural gas and prices from U.S. supply regions shows that there are sufficient natural gas supply resources to support both domestic and export demand within a reasonably low-price range of \$3 to \$4/MMBtu (assuming no regional pipeline constraints).
- *Lack of new natural gas pipeline infrastructure is a material impediment to bringing the lowest cost gas resources to the market.* The lack of new pipeline infrastructure already has likely contributed to sub-optimal current natural gas market conditions and price formation. As a result, the U.S. is unable to utilize the lowest cost natural gas resources from the Northeast region (and particularly from the Marcellus and Utica shale gas basins). Several pipeline projects in the Northeast have been cancelled since 2020 largely as a consequence of regulatory and permitting challenges (See **Table 4**). In the absence of these infrastructure pipeline cancellations, natural gas consumers would likely face less upward price pressure and have access to lower cost natural gas supplies which in turn would ultimately lead to lower domestic natural gas prices.
- *Natural gas price impacts from expanding pipeline infrastructure are expected to reduce natural gas prices, even with higher levels of U.S. LNG exports.* The natural gas price reductions from an expansion in pipeline infrastructure accessibility are estimated to be between \$0.25 and \$0.30/MMBtu in 2025 and between \$0.25 and \$0.40/MMBtu in 2035 across the numerous scenarios analyzed, see Table 3.
- *Addressing the underlying permitting and other roadblocks to midstream natural gas infrastructure is a critical priority for energy policy to enable low-cost natural gas resources to reach the market.* Additional pipeline infrastructure buildouts, especially from the Eastern low cost supply region (and particularly from the Marcellus and Utica shale gas basins), has the potential to provide intramarginal gas supplies which could support higher domestic and export demand and reduce the impacts on natural gas commodity prices.

Constraints within the existing permitting regimes have contributed to delays and cancellations of multiple pipelines, which illustrates high project-specific risks and uncertainty. In contrast, the analysis shows that the expeditious build-out of planned or additional pipeline infrastructure without permitting delay is important to alleviate short-term price impacts and provide for more efficient development of low-cost resources.



**Table 4:** Natural Gas Pipeline Projects (Cancelled or On Hold)

Project Name	Project Type	Beginning State	Ending State	Additional Capacity (MMcf/d)
<b>Atlantic Coast Pipeline</b>	New Pipeline	WV	NC	1,500
<b>Constitution Pipeline</b>	New Pipeline	PA	NY	650
<b>Creole Trail Expansion Project 2</b>	Reversal	LA	LA	1,500
<b>Permian Global Access Pipeline</b>	New Pipeline	TX	LA	2,000
<b>Permian to Katy Pipeline</b>	New Pipeline	TX	TX	2,000
<b>Western Energy Storage and Transportation (WEST) Header Project</b>	New Pipeline	UT	MX	2,000
<b>Wright Interconnect Project</b>	Expansion	NY	NY	650
<b>Bluebonnet Market Express Pipeline</b>	New Pipeline	TX	TX	2,00
<b>Delhi Connector Pipeline</b>	New Pipeline	LA	LA	2,000
<b>Gemini Gulf Coast Pipeline</b>	New Pipeline	TX	TX	1,500
<b>Haynesville Global Access Pipeline</b>	New Pipeline	LA	LA	2,000
<b>Lake Charles Expansion (Magnolia LNG)</b>	Reversal	LA	LA	1,362
<b>Pacific Connector</b>	New Pipeline	OR	OR	1,200
<b>Pecos Trail Pipeline</b>	New Pipeline	TX	TX	1,850
<b>PennEast Pipeline Phase 1</b>	New Pipeline	PA	NJ	1,107



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