CRA Insights: Energy

Charles River Associates

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The impact of LNG exports on US markets

The impact of LNG exports on domestic natural gas prices has been analyzed and debated over the past several years even though these price impacts have yet to be felt in the US markets. In the global LNG marketplace, new entrants, including the US, are influencing the nature and structure of global LNG markets, which will ultimately impact US gas prices. New global LNG capacity has produced a surplus, and with that, created a buyer's market. Buyers are now seeking more favorable contracting terms including shorter contracts, flexible deliveries, and a shift to natural gas or "basket" pricing indexes. These contracting trends, along with the new export capacity, may "commoditize" LNG terminal assets and support heightened competition in global LNG markets.

Meanwhile, there have been major shifts in US energy policy. These policy shifts may impact domestic demand for natural gas and the disposition of our burgeoning shale production. In the foreseeable future, US LNG exports may be needed to balance supply and demand in US natural gas markets, rather than compete with domestic markets for supply. Market participants will need to revisit their perspective on how LNG exports will influence US gas prices in the future.

In this *Insights*, we address policy and market trends and their influence on natural gas balances and prices in the US, including:

- The evolution of LNG trade and its impact on contracting and new infrastructure;
- Potential impacts of diverging state and federal energy policy on US markets;
- US pricing impacts with LNG exports as the market on the margin (i.e. the last market to be dispatched to balance supply available);
- Potential future contracting structures; and
- The dynamics of seasonal or swing dispatch of US LNG.

How the evolution of LNG trade affects contracting and infrastructure

Current market factors driving trends in LNG pricing and contracting involve much more than straightforward supply and demand balances. LNG trade, with its new entrants, is maturing into a

fully developed commodity market. This is evident from the shorter contract terms and flexible deliveries currently sought by buyers. In addition, depressed global LNG prices are impacting marketing and financing activities, causing project developers to reconsider contracting terms and capital requirements. As an example, Texas LNG has proposed both a smaller terminal size (.28 Bcf/d per phase) and “risk sharing” contract structures.

The next phase of LNG infrastructure development needs to address the realities of this evolving commodity market. The need for capital efficiency and contract flexibility could lead to smaller modular LNG terminal development in the future. As further evidence of this future trend, Cheniere recently announced that the next planned expansion of the Corpus Christi terminal will employ seven modular liquefaction trains (0.18 Bcf/d each) instead of the two larger trains (0.6 Bcf/d each) originally proposed.

Diverging state and federal energy policy

Under the current administration, energy policy appears to promote the production and utilization of hydrocarbons (natural gas, oil, and coal). At the same time, many states are pursuing expanded renewable programs which, in some cases, limit their region’s access to incremental natural gas supply by denying new pipeline permits. While federal policy can promote natural gas production and interstate commerce (pipelines) through its regulatory authority, state policy and regulation affects market demand. Depending on the outcome of future court rulings, states that choose to, may have expanded influence on the energy mix within their borders. The impact of these diverging policies is evident in the most recent Energy Information Administration (EIA) natural gas forecast (2018 Annual Energy Outlook), which forecasts that domestic natural gas production will increase by 29.4 Bcf/d through 2030 (2.6% CAGR), while domestic consumption will only increase by 11 Bcf/d (1.1% CAGR) during the same period. With federal and state agencies implementing diverging energy policies, the US is experiencing robust growth in gas production while domestic gas markets are experiencing very modest growth. If these trends continue into the future, exports will be required to balance domestic supply and demand.

The market on the margin

As previously noted, the current EIA natural gas market forecast has domestic consumption of natural gas increasing by 1.1% per year between 2017 and 2030. EIA’s moderate domestic growth forecast points to the need for exports to balance natural gas production growth in the future. This same EIA forecast predicts that LNG exports will represent almost 43% of the total US demand growth between 2017 and 2030 (Figure 1).

Natural gas supply is dispatched (theoretically) daily on a variable cost basis, with the lowest variable cost between supply and market dispatching first. Given the high variable costs associated with LNG exports (terminal variable costs and international shipping) and the magnitude of the export volumes, it is likely that LNG exports will ultimately represent the incremental (last to dispatch) demand required to balance US shale production. With LNG representing the incremental demand on balancing incremental production, global LNG pricing should have an influence on Henry Hub prices.

Figure 1: US Supply and Demand Balances (2017–2030)

	LNG Exports (Bcf/d)	Net Pipeline Exports (Bcf/d)	Net Total Exports (Bcf/d)	US Domestic Consumption (Bcf/d)	US Dry Production (Bcf/d)	US Supply/ Demand Balance
2017	1.62	-1.37	0.25	73.1	74.2	1.14
2018	2.82	-0.85	1.97	77.2	79.3	2.14
2019	5.12	0.63	5.75	79.5	85.5	5.92
2020	8.11	1.62	9.73	79.5	89.5	9.95
2021	8.44	2.05	10.5	79.9	90.7	10.8
2022	8.99	2.71	11.7	80.7	92.7	12
2023	10.1	2.93	13	81.5	94.8	13.3
2024	11.4	3.51	14.9	81.2	96.4	15.2
2025	12.5	3.67	16.1	81.6	98.1	16.5
2026	13.2	3.92	17.1	81.8	99.3	17.4
2027	13.9	4.11	18	82.5	101	18.4
2028	14.3	4.33	18.6	83.4	102	19
2029	14.5	4.52	19	83.9	103	19.3
2030	14.4	4.68	19.1	84.2	104	19.5
2017-2030 Increase (Bcf/d)	12.84	6.05	18.89	11.06	29.4	

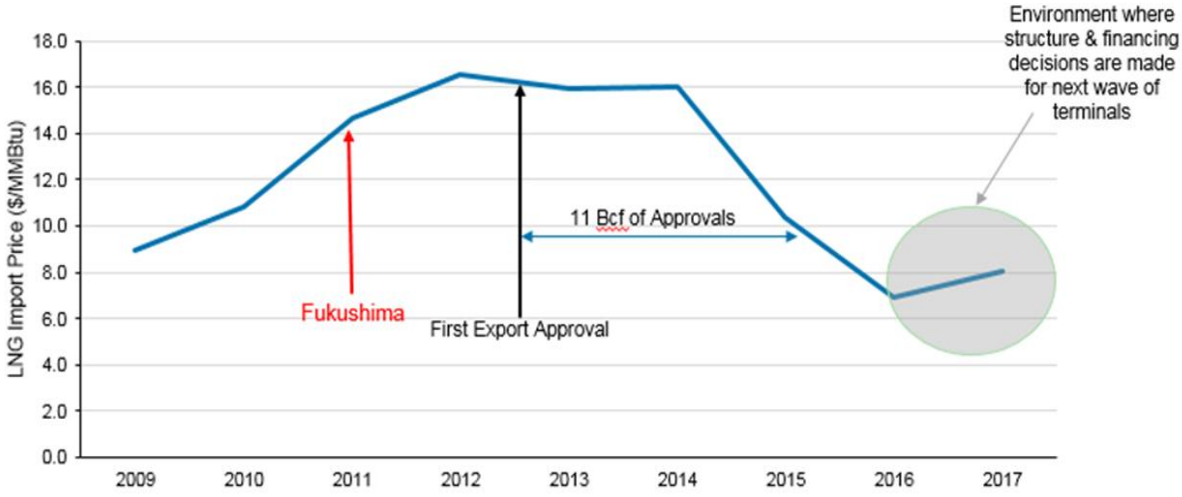
Source: EIA 2018 Annual Energy Outlook

While LNG exports are perceived to have a positive (upward) impact on domestic gas prices, it may be more accurate to say that international gas markets will establish new boundaries for domestic gas prices through LNG exports. As evidence, it should be noted that nearly 10 Bcf/d of LNG export capacity will come on line by 2021. During that same timeframe, Henry Hub futures are trading at a slight decrease from current levels. If the futures markets are accurate, it would signal that other market forces need to be considered. Global LNG markets may be the “other market forces” to consider in that analysis.

Contracting structures of the future?

As an additional 7 Bcf/d of approved export terminals await final investment decisions, what contract structures will these new terminals employ to obtain market support and get built?

Figure 2: LNG Import Price in Japan (USD/MMBtu)



Source: World Bank

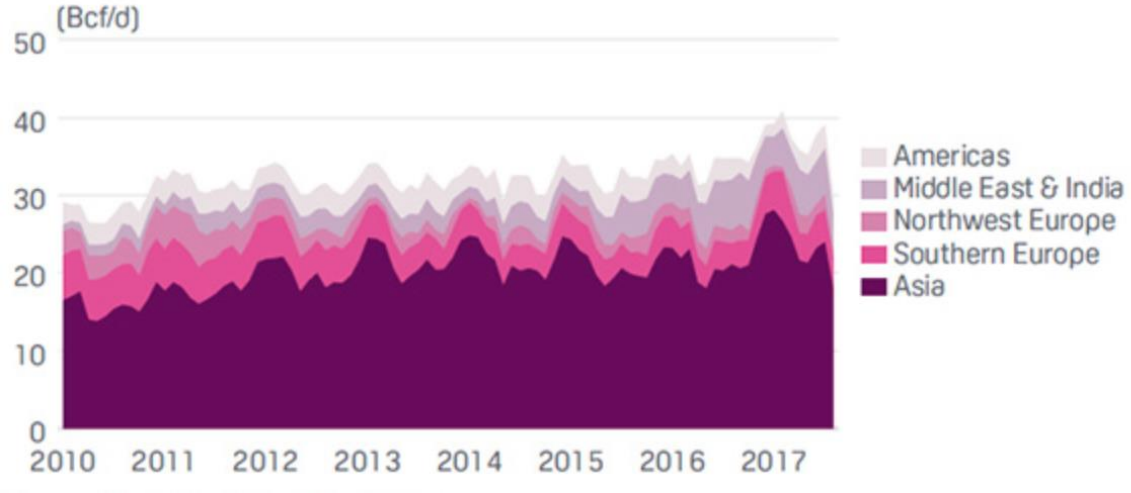
As shown in Figure 2, contracts for the initial wave of US LNG terminals were executed at a time when market prices supported full recovery of all fixed and variable costs. This is clearly not the case today. Global LNG prices have fallen since 2014 due to a combination of new supplies and slowing Asian growth. That said, help may be on the way in the near term as global LNG market forecasts indicate that global markets will transition from supply surplus to supply deficiency early in the next decade. While this should bring some relief to proposed export terminals, global prices may not rise to a level that allows for full recovery of the cost to build new terminals. If this is the case, terminal developers and their off-takers will need to consider contract structures that mitigate or share cost risk.

Given the large number of variables in the global marketplace, predicting Henry Hub prices in the future involves a greater degree of uncertainty. Ultimately, a broader understanding of global natural gas markets will be required by all parties involved in US natural gas markets.

The dynamics of seasonal or swing dispatch

While initial data indicate that Cheniere's Sabine Pass terminal is operating at a high utilization rate, it is possible that US LNG exports could take on variable dispatch characteristics in the future, and potentially increase US price volatility. The two most likely causes of variable dispatch of LNG terminals are the seasonal nature of global LNG markets (Figure 3) and the case where the US becomes a swing supplier to the global LNG market.

Figure 3: Global LNG Demand



Source: Platts Analytics' Bentek Energy

Under the seasonal dispatch scenario, we would expect to see extended periods of high demand followed by extended periods of lower demand. This scenario could drive the need for additional storage in the Gulf region. Examining Figure 3, it also appears that the seasonal swings are becoming more pronounced with increases in global demand. A conservative estimate of 1 Bcf/d seasonal swing for US exports would technically require between 150 to 200 Bcf of working gas storage to manage seasonal volumetric differences. We note that in the recent past, shale production has been able to respond to infrastructure and load changes by ramping up production in a fairly responsive manner. In the third quarter of 2017, gas production in eastern Ohio ramped up by 0.9 Bcf/f to quickly match the new export capacity created by Phase 1 of the Rover Pipeline. Absent the ability of shale production to match seasonal LNG dispatch, we may see a return to the seasonal price differentials which were common prior to the shale boom. In turn, these price signals could support additional natural gas storage investment and development.

If we consider the swing supplier model, we should expect the demand changes to be more abrupt. While these demand changes may be too abrupt for shale production to respond, the shorter nature of this load pattern could be accommodated by the existing storage infrastructure in place in the Gulf region. Now that the Gulf Coast is the most important growth market, we could assume that it will take on some of the "market area" characteristics, such as greater demand-driven price movement. As a point of reference, Cheniere's Sabine Pass terminal currently has three liquefaction trains in service, representing a demand equivalent to 25 – 500 MW gas-fired power plants.

While the seasonal market model initially points to the need for additional storage, the direction the market takes will be driven by the economics of both seasonal supply and seasonal storage.

As a final point, we need to consider that in 2020 the US LNG terminal fleet will primarily consist of assets with long-term contracts. The considerable sunk (liquefaction) costs embedded in these contracts will allow these plants to dispatch more economically by just considering the variable cost component of their operation (commodity cost, gas transport to terminal, terminal variable cost and

shipping overseas). The next wave of LNG terminal builds in the US may need to consider expensive liquefaction costs in their dispatch model. This is especially true if the market moves to more spot transactions rather than fixed long-term agreements. This could have a negative impact on where future US LNG terminal fleet sits within the global LNG dispatch queue.

Conclusion

Market trends and regulatory initiatives indicate that LNG exports will be critical in balancing US natural gas supply and demand. With LNG exports as the marginal market to balance production, global LNG markets will have an increasing influence on US gas prices. Further, we envision that US LNG exports will be characterized by increasing degrees of variable dispatch and spot cargoes, which may increase price volatility and ultimately the value and need for seasonal supply or storage services in the Gulf region. Going forward, a greater understanding of global gas markets is essential to accurately forecast natural gas price trends and their impact on future infrastructure requirements.

Contacts

Herb Rakebrand
Principal
Boston
+1-617-425-3758
hrakebrand@crai.com

Jim McMahon
Vice President
Boston
+1-617-425-6405
jmcmahon@crai.com