



US LNG Export Growth and the Benefits to Midstream

July 2018



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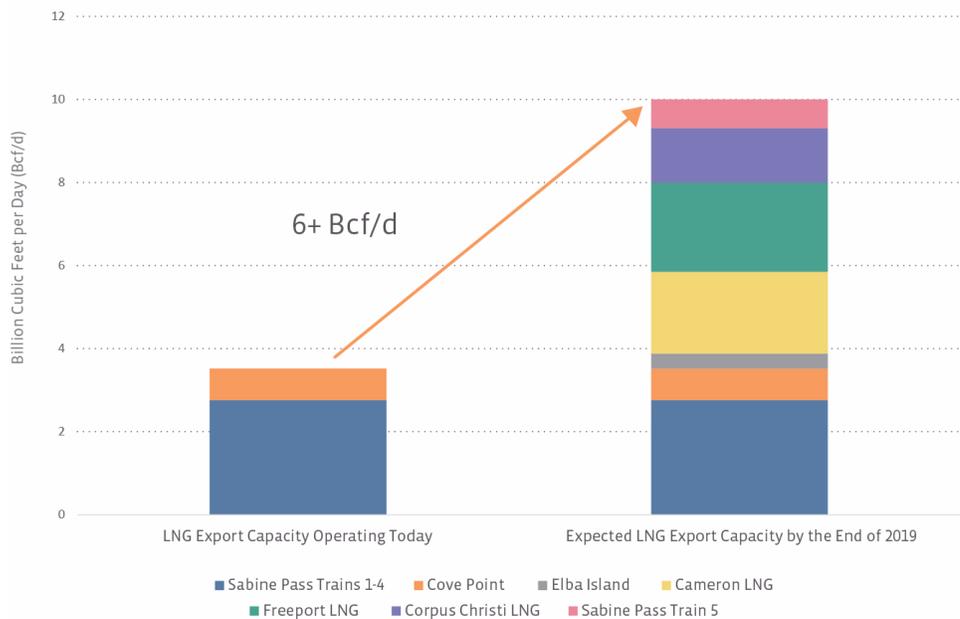
In 2017, the US was one of 19 countries exporting liquified natural gas (LNG) and played a relatively small role in the global market. To be precise, LNG exports from the US represented just 5% (1.9 Bcf/d) of the 38.2 Bcf/d global LNG market. That said, the US is on the brink of adding significant LNG export capacity in 2019 and becoming a sizable player in the global LNG market. As an indication of the rising significance of the US, the World Gas Conference was held in Washington, DC in June 2018. This was the first time in thirty years that the conference – which takes place every three years – was hosted in the US.

In this piece, we look at US LNG export capacity additions expected to come online in 2019, as well as planned projects in the US that may come online in 2020+ to help address a potential global LNG supply gap in the mid-2020's. We also look at the potential implications for LNG exports given the trade tensions with China. On a more local level, we look at the broad benefits of LNG exports for the US midstream space, namely increasing infrastructure demand and facilitating natural gas production growth.

US LNG export capacity to dramatically increase in 2019.

In mid-2018, operating US LNG export capacity is limited to Cheniere's (LNG, CQP, CQH) Sabine Pass terminal in Louisiana and Dominion Energy's (D) Cove Point terminal in Maryland, which shipped its first cargo earlier in 2018. By the end of 2019, though, LNG export capacity is expected to jump to 10 Bcf/d as shown below. All this capacity will be added in Texas and Louisiana, except for Kinder Morgan's (KMI) Elba Island facility on the coast of Georgia. The added capacity in the US will be a significant increase for the global market, but it likely will only put a dent in the world's growing appetite for LNG.

US LNG Export Capacity to Nearly Triple By the End of 2019



Note: Capacity represents peak nameplate capacity
Source: Energy Information Administration



The concern is that the lack of FIDs in recent years will lead to insufficient LNG supply in the 2020's.

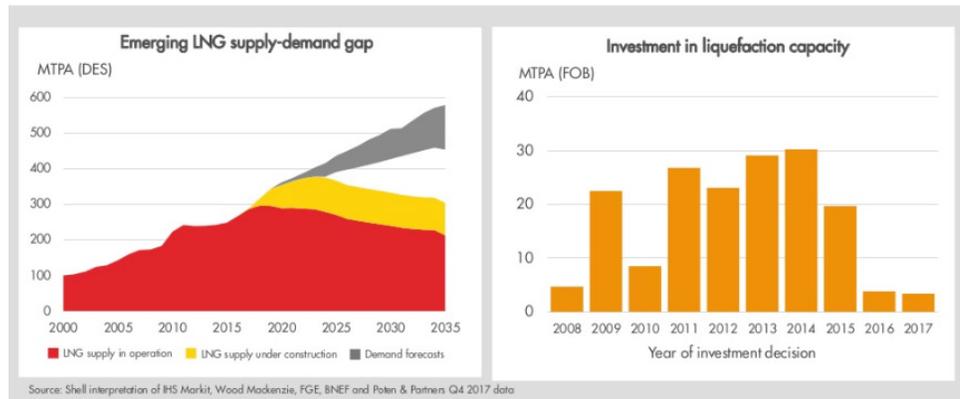
Is a global supply gap looming, and how could the US help fill the gap?

Shell (RDS-A) has highlighted the potential for a supply gap in the LNG market in the mid-2020's in the slide below from its [LNG Outlook 2018](#). The chart on the right shows the dearth in final investment decisions¹ (FID) for adding liquefaction capacity globally in 2016-17. For its part, the US did not have any FIDs in these years. Cheniere's FID for Train 3 at Corpus Christi (0.7 Bcf/d of capacity) in May 2018 was the first FID for liquefaction capacity in the US since 2015. The concern is that the lack of FIDs in recent years will lead to insufficient supply in the 2020's.

SHELL LNG OUTLOOK 2018

SUPPLY INVESTMENT REQUIRED TO MEET LONG-TERM DEMAND GROWTH

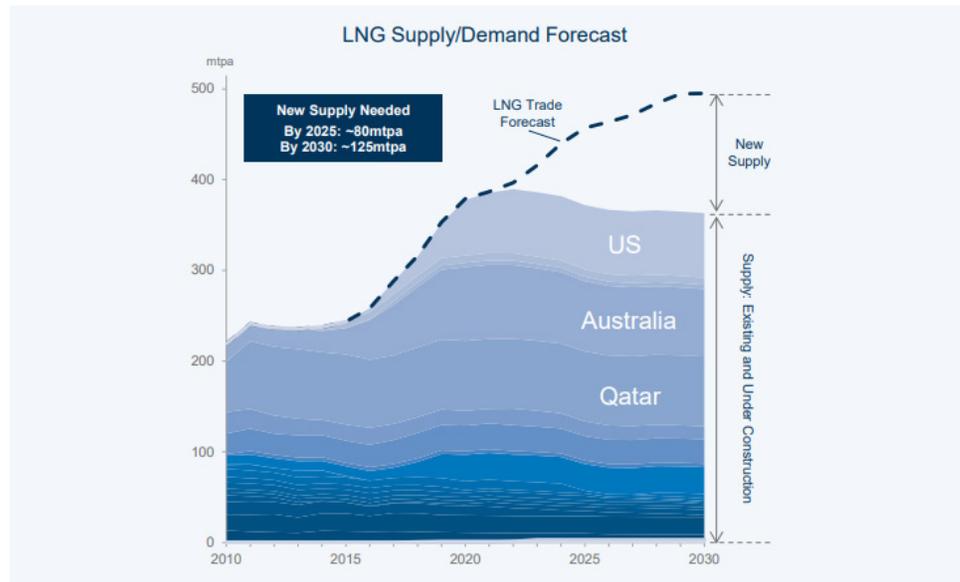
LACK OF SUPPLY INVESTMENT RISKS FUTURE GLOBAL LNG MARKET GROWTH



Royal Dutch Shell plc

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Source: Shell LNG Outlook 2018



Source: Cheniere Investor Update Presentation from May 29-30, 2018

Similarly, Cheniere has forecasted in its [presentations](#) that another 80 MMTPA (10.5 Bcf/d) of LNG supply will be needed by 2025 as shown above. By 2030, Cheniere estimates 125 MMTPA (16.4 Bcf/d) of supply will be needed in addition to what's currently operating and under construction.

1// In other words, final investment decisions represent a company's commitment to move forward with a project.



There are several expansions and new projects on the drawing board in the US that could help fill this supply gap. Some projects expected to come online in 2019 could add trains² in the future. In addition to Train 3 at its Corpus Christi terminal, Cheniere has proposed seven additional midscale trains at Corpus Christi and also has the necessary permits to add a sixth train at Sabine Pass (0.7 Bcf/d of capacity). Sempra Energy's (SRE) joint venture Cameron LNG project has received regulatory approval for two additional trains (1.4 Bcf/d of capacity). Freeport LNG has applied for FERC approval to build and operate a fourth train (0.7 Bcf/d of capacity). Aside from expansions, there are projects that have been fully approved but have not reached FID including Energy Transfer's (ETE, ETP) Lake Charles LNG, Exxon's (XOM) Golden Pass LNG joint venture with Qatar Petroleum, and Magnolia LNG.

LNG Export Projects Fully Approved by the DOE and FERC

	Proposed Design Capacity (Bcf/d)	Proposed Design Capacity (MMTPA)
Corpus Christi - Train 3 *	0.7	5.0
Sabine Pass - Train 6	0.7	5.2
Cameron LNG - Trains 4 & 5	1.4	10.0
Lake Charles LNG	2.2	16.5
Golden Pass Products	2.1	15.6
Magnolia LNG	1.1	8.0
Total	8.2	60.3

*Project has reached FID.
Source: Energy Information Administration, FERC

There are several more LNG export projects that have been proposed to the Federal Energy Regulatory Commission (FERC), which oversees the siting and construction of LNG export facilities. Notable proposed projects include Sempra's Port Arthur LNG, which announced a 20-year contract with Polish Oil & Gas in June 2018. The project has not reached FID but is expected to begin exporting LNG in 2023. Also on the list, Tellurian's (TELL) Driftwood LNG is expected to begin operations in 2023 and to have a total capacity of 27.6 million tons per annum (MMTPA), which equates to nearly 4 Bcf/d.

Clearly, projects will need to reach FID and begin construction if they are to help fill the potential LNG supply gap. Before reaching FID, companies will want to have financing decided and commercial contracts in place covering the capacity (in other words, assurance of sales). Shell has attributed the lack of FIDs to a disconnect between buyers that prefer short-term contracts or spot deliveries without a contract and LNG suppliers that want long-term contracts to support the hefty investment in liquefaction capacity. While this is an issue facing LNG projects globally, US trade policy is a potential obstacle specific to projects in the US.

2// When discussing LNG, trains are the industrial facilities that cool natural gas into LNG.



Gathering pipelines, processing plants and larger natural gas pipelines are generally required infrastructure between a natural gas well and a liquefaction facility.

What are the implications of a trade dispute with China?

China led global growth in LNG imports in 2017, increasing its imports by 1 Bcf/d to become the world's second-largest LNG importer behind Japan. China alone accounted for 44% of the global increase in LNG imports in 2017. If LNG exports were to come under fire in a trade dispute with China, it would likely be a negative for LNG projects in the US looking to secure future sales contracts with Chinese customers. Uncertainty probably complicates commercial agreements until there is more visibility, likely delaying additional FIDs. That said, it's worth noting that 40 countries imported LNG in 2017, and the US exported LNG to 25 different countries. While China is a major player in the LNG market, it's not the only customer. As highlighted by the contract inked by Port Arthur LNG, Europe is clearly a market for US LNG exports as countries look to diversify their gas supply from Russia.

Midstream Benefits: LNG exports increase infrastructure demand.

Shifting from the global stage, US LNG exports are beneficial for US midstream companies. It probably goes without saying that infrastructure is needed to get natural gas from the wellhead to an LNG export facility. Gathering pipelines, processing plants (to remove impurities and separate natural gas liquids) and larger natural gas pipelines are generally required infrastructure between a natural gas well and a liquefaction facility. In some cases, new infrastructure may be needed, and in others, existing infrastructure may be expanded or reversed to supply natural gas to an LNG export facility. Of course, pipeline expansions are easier than newbuild projects and can be completed by enhancing pumps to increase capacity (greater compression).

Natural gas sourcing for each LNG project can vary. Cheniere will use a combination of third-party pipelines, as well as pipelines Cheniere owns, to supply natural gas to its LNG export facilities at Sabine Pass and Corpus Christi. Cheniere's Creole Trail Pipeline is interconnected with several pipelines and receives volumes from Williams Partners' (WPZ) Transco, Spectra's (SEP) TETCO, and ETP's Trunkline pipelines to supply Sabine Pass. For Corpus Christi, Cheniere's 23-mile Corpus Christi pipeline similarly connects to multiple natural gas pipelines, on which Cheniere has capacity. For example, in 2015, Cheniere and Natural Gas Pipeline Company of America (NGPL) – jointly owned by KMI and Brookfield Infrastructure Partners (BIP) – signed a 20-year agreement in providing capacity on NGPL for the gas supply at Corpus Christi. An expansion of NGPL will facilitate the capacity contracted for Corpus Christi. For a midstream company, it's not difficult to see the appeal in a long-term contract that supports an expansion project.

With its integrated approach, TELL plans to invest \$7 billion to build a network of three pipelines, including a 2 Bcf/d pipeline from the Permian and a 2 Bcf/d pipeline from the Haynesville, with both terminating in Gillis, Louisiana. A 96-mile pipeline with 4 Bcf/d of capacity is planned between Gillis and the Driftwood LNG facility to supply the export facility. Upstream, TELL has acquired acreage in the Haynesville for producing natural gas.



US LNG Export Growth and the Benefits to Midstream

Infrastructure provides the vital bridge between producing areas and LNG export facilities.

While most LNG export facilities are planned for the Gulf Coast, that doesn't mean that gas supply will only come from the Gulf Coast. Thanks to the interconnectedness of US natural gas pipelines, Sabine Pass can source natural gas from every producing region in the Lower 48 east of the Rockies. This obviously includes the prolific Marcellus and Utica. While there can be different approaches for supplying natural gas to export facilities (newbuilds vs. existing capacity, owning pipelines vs. owning capacity on third-party pipelines) and the source of natural gas can vary, infrastructure provides the vital bridge between producing areas and LNG export facilities.



Source: US Energy Information Administration.
Design: Alerian

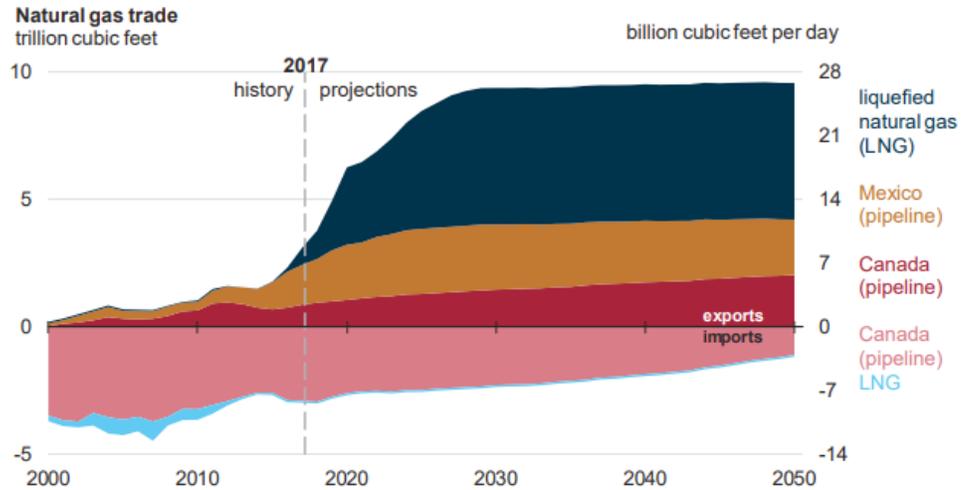
The broader benefits: LNG exports facilitate more US gas production.

LNG exports benefit energy companies broadly, not just those companies supplying the LNG export terminals or operating export terminals. How? Without the ability to export natural gas on tankers as LNG and via pipelines to Mexico and Canada, as shown in the chart on the next page, the natural gas supply in the US would overwhelm domestic demand. This would have negative implications for natural gas prices (bad for producers) and limit production growth (bad for producers and midstream companies).



US LNG Export Growth and the Benefits to Midstream

The incremental gas demand from LNG projects helps facilitate the expected growth in natural gas production.



Source: US Energy Information Administration, Annual Energy Outlook 2018

The Energy Information Administration forecasts that dry natural gas production will grow to 84.5 Bcf/d³ in 2019. With US LNG export capacity expected to approach 10 Bcf/d in 2019, almost 12% of US dry natural gas production could be used for LNG exports. The incremental gas demand from LNG projects helps facilitate the expected growth in natural gas production. Production growth benefits midstream companies as volume-driven businesses. More natural gas means more volumes to gather, process and transport, and that requires more infrastructure. In this way, LNG exports support growth opportunities for natural gas pipelines and processing plants.

Conclusion

In this piece, we have barely scratched the surface in global LNG markets, neglecting planned projects in other parts of the world to specifically focus on the US. Clearly, these projects will compete with the US, and projects in the US will also compete against each other. The US is poised to play an important role in the global LNG market and may play an even bigger role as additional projects reach final investment decision (FID). Permitting progress and additional FID announcements will bear watching — and not just by LNG suppliers and customers. Given that LNG exports increase infrastructure demand and extend the runway for US natural gas production growth, midstream companies will also have an interest in LNG export projects moving forward.



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Contact

www.alerian.com

index@alerian.com // 972.957.7700

4925 Greenville Ave., Suite 840, Dallas, TX 75206