

The Next Wave of Global LNG Investment Is Coming

Sylvie Cornot-Gandolphe

With an annual growth of 10% in 2017 to 290 million tons (Mt)¹ and 8.3% in the first half of 2018,² LNG demand is rising faster than expected. Accounting for 44% of global demand growth in 2017, China is the main driver of the growth as the government has made natural gas a key policy choice to reduce air pollution and restructure its high-carbon energy mix. Demand from emerging economies has also boomed in past years.³ LNG prices have soared since the fourth quarter of 2017 with spot deliveries above \$10/million British thermal units (MBtu) in summer 2018 and above \$12/MBtu for forthcoming winter delivery.

Yet almost no new investments into export capacities were sanctioned in the past three years. This is changing as **investment in new LNG export capacity is coming**. A final investment decision (FID) on a huge project (LNG Canada) was taken at the beginning of October and several projects are close to FID.

Qatar in pole position

In 2017, the world's LNG leader Qatar lifted its self-imposed 2005 moratorium on new production at the North Field and unveiled plans to expand its LNG capacity from 77 million tons per annum (Mtpa) to 100 Mtpa by 2024, recently revised upwards to 110 Mtpa. In March 2018, Qatar Petroleum selected Japan's Chiyoda to carry out front-end engineering and design (FEED) of three new mega trains of 7.8 Mtpa each — the world's largest. First LNG deliveries are expected in 2023.

This expansion project will be the lowest cost of any planned LNG supply additions globally (\$5-5.6/MBtu delivered in Asia)⁴ posing a formidable competitive challenge to other new LNG supply projects.

Second wave of US LNG projects under way

With its large reserves at low cost, the US is a major contributor to the current wave of global LNG projects. In addition to the six projects of the first wave of US LNG projects, there are another three fully

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permitted projects, and more than a dozen representing around 200 Mtpa of capacity currently being proposed to US regulators.⁵ However, none of the second wave of US LNG export projects has taken FID yet due to lack of sufficient and firm long-term offtake agreements. Securing financing is key to move forward. The Trump's administration is giving a high-level support to LNG exports yet, the ongoing trade dispute between Washington and Beijing may close the growing Chinese LNG market for US LNG suppliers.⁶ Nevertheless, the first wave of US projects is being built without financial backing from China. The first-ever contracts between China and the US were signed in February 2018 by CNPC and Cheniere, and were instrumental to the FID taken on Corpus Christi 3. Some projects, which directly targeted China or Chinese financing (such as Alaska LNG, Delfin LNG), are likely to be postponed. But several non-Chinese LNG buyers have signed contracts with promoters of new export projects. For instance, Venture Global, the promoter of the Calcasieu LNG project, has signed six 20-year SPAs, of which four since May 2018, with Shell, Galp, Repsol, BP, EDF/Edison and PGNIG, bringing offtake commitments for the project to 8 Mt/y.

Prospective US project developers are looking at new ways to attract equity financing, notably Tellurian's Driftwood LNG project.⁷ The company is proposing buyers to not only sign for LNG offtake, but also to provide 65-70% of project equity. Its business model involves an integrated presence across the US supply chain. Tellurian estimates that its integrated, cost-based business model will allow to reduce the LNG price to \$6/MBtu delivered in Japan.

US project developers are also seeking for liquefaction cost reductions, targeting a liquefaction cost in a range of \$500-700/t, via multiple, small-scale liquefaction trains that can be pre-fabricated off-site. Integrated, cost-based models, are also promoted (Driftwood LNG, Golden Pass), instead of the tolling model.

Thanks to access to low-cost gas (\$3/MBtu), possibly lower if considered as a free by-product of oil production, cost reductions allowing liquefaction costs per MBtu in a range of \$2 (brownfield projects) to \$2.5 (greenfield projects), and assuming a 15% variable liquefaction fee and \$1.5/MBtu for shipping costs to deliver LNG to Asia, the delivery cost of the second wave of US LNG is expected to be around \$7/MBtu for brownfield projects and \$7.5/MBtu for greenfield projects,⁸ making US LNG very competitive (although

soaring US steel prices may increase capital costs of LNG plants by 10%).

The second wave of US LNG projects rests on five key projects, which are expected to take FID in 2019 and start first deliveries in 2022-2024: Lake Charles LNG, Louisiana; Golden Pass LNG, Texas; Magnolia LNG; Calcasieu Pass LNG; Driftwood LNG. These could add a combined 75 Mtpa capacity, making the second wave of US LNG projects as big as the first one. In addition, the expansion of projects of the first wave (Corpus Christi Train 3, FID taken in 2018, Sabine Pass Train 6, Corpus Christi Stage 3, Freeport Train 4, FID expected in 2019) could add 23.5 Mtpa of capacity by 2022.

Russia on the starting block

The \$27 billion Yamal LNG project successfully started at the end of 2017. Novatek is now looking to develop a second large-scale project, Arctic LNG 2, a three-train project of 6.6 Mtpa each, planned to go into operation in 2023. FID is expected to be taken before the end of 2019. In addition, Gazprom is expected to take FID on the third phase of the Sakhalin 2 LNG plant in early 2019 and still has Baltic LNG on its books.

To reduce costs, Novatek plans to build Arctic LNG 2 terminal on gravity-based structure barges, thus reducing construction costs by 30% (about \$9 billion) compared with Yamal LNG. Novatek plans to build a trans-shipment facility in Kamchatka, reducing travel time to deliver LNG to Asia and increasing the use of the Northern Sea Route.⁹ Total already took a 10% share in the project and Novatek, which intends to use more equity financing (45% of the project costs), is in talks with prospective partners, including CNPC, Kogas, Japanese companies, as well as Saudi Aramco.¹⁰

Mozambique finally coming

Many substantial offshore gas discoveries have been made in Mozambique, but a lack of government experience in dealing with large upstream projects has slowed the pace of LNG projects towards FID. This has changed last year when Italy's Eni and its partners gave the go-ahead for an \$8 billion floating LNG (FLNG) project (Coral LNG), with a capacity of 3.4 Mtpa and a planned 2022 start-up.

Two other projects are making progress towards FID. Mozambique LNG, led by Anadarko, received government approval in March 2018 for its two-train LNG project of a capacity of 12.88 Mtpa in a first phase. Anadarko has signed offtake agreements (binding and non-binding) for 6.7 Mt/y and expects to take FID in the first half of 2019 with first LNG deliveries scheduled in 2023-2024. The project has achieved significant cost reductions amounting to approximately \$4 billion,¹¹ and the first two liquefaction trains could be delivered for less than \$600/t.

ExxonMobil submitted in July 2018 its plan for the first phase of the Romuva LNG project, which includes two liquefaction trains of 7.6 Mtpa each, fed by an expansion of ExxonMobil's proposed Rovuma project to cut production costs. FID is scheduled for 2019, with a 2024 start-up.

Papua New Guinea's expansion close to FID

ExxonMobil, in partnership with Total, plans to double the export capacity of Papua's PNG LNG project, by adding three new LNG trains, with a total capacity of 8 Mtpa. Total's operated Elk-Antelope gas field, instead of being a standalone export facility, will be integrated with the existing ExxonMobil-operated export plant, as part of a cooperative approach to save costs.¹² At a cost of \$12-14 billion, the expansion is expected to be much cheaper than the original \$19.5 billion cost of building the PNG LNG plant. FID could come in 2019. PGN LNG recently signed two short-term deals, one with BP for 3.15 Mt over five years and the second with PetroChina for 1.35 Mt for three years. With its low-cost supply and proximity to Asian markets, the project is well positioned to be part of the new wave of global LNG projects.

Canada: tax exemptions help

Canada was seen as an ideal location for LNG export facilities, but in recent years, lack of political support, environmental opposition, high labour costs, provincial taxes on LNG and import duties on steel, have all dampened Canada's efforts to develop LNG export projects. Of the 23 proposed projects that have received licences, none have moved forward until recently. Several have been delayed and five proposed terminals have been cancelled. To support LNG exports, the

newly-elected government of British Columbia has granted subsidies and tax breaks to LNG projects,¹³ enabling the two advanced projects in British Columbia (LNG Canada and Woodfibre LNG) to moving towards FID/construction at an accelerated pace. At the beginning of October, Shell and its partners (Mitsubishi, Petronas, PetroChina and Kogas) took FID on LNG Canada and announced that construction is to begin immediately with first exports from the first phase (14 Mtpa) expected before the middle of the next decade. LNG Canada is a \$31 billion, 28 Mtpa export project to be built on the West coast at Kitimat.

Nigeria's LNG partners working hard on LNG expansion

Nigeria is a long-established LNG producer. Stakeholders of Nigeria LNG (NLNG) plant at Bonny Island have made progress towards the building of a seventh train (8.5 Mtpa, \$4.3 billion), which would increase the total LNG output of NLNG to more than 30 Mtpa. NLNG expects to take FID in 2019 and start first deliveries in 2024.

Conclusion: the new wave of global LNG projects is taking shape

Investment in new LNG projects is coming back worldwide, with projects advancing in Qatar, Russia, Mozambique, Papua New Guinea, the USA and Canada. This review has identified some 185 Mtpa of capacity (excluding expansions from the first wave of US LNG projects) that promoters expect to sanction before the end of 2019 and that will be commissioned by 2022-2024. That may ease a rapid tightening of the LNG market in the early 2020s, although delays in FID and construction, and cancellations, cannot be ruled out.

All projects have announced massive cost reductions and the shifting behaviour of LNG buyers towards smaller volumes and/or shorter periods, with greater flexibility in pricing and destination, makes oil majors likely to be the suppliers of the future, thanks to their ability to access finance via balance sheet debt and their LNG portfolio trading capabilities. New financing models are proposed (e.g. Tellurian), which may attract a new class of investors, such as sovereign and private investment funds. Financing by Chinese banks

and companies is rising. Chinese companies are expected to be major off-takers and investors in many projects, but outside the US from the time being.

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