Monthly LNG Opinion

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Mid-Scale LNG Touted In Buenos Aires

Mid-scale liquefaction, defined as baseload projects with capacity ranging between 0.1 and 2.0 MMt/y, is receiving greater attention as developers seek to monetize stranded gas resources or compete in smaller energy markets. Unlike their smaller peak shaver cousins, which liquefy small gas flows gas during off-peak periods and store it for rapid regasification in periods of peak demand, mid-scale plants are meant to liquefy and deliver LNG steadily throughout the year. Several perspectives on mid-scale development were offered at the World Gas Conference in Buenos Aires earlier this month, including those from Repsol, a potential project developer, and Linde, a technology provider and engineering, procurement and construction contractor.

Many rationales for mid-scale LNG were broached. The technology has the potential to unlock stranded gas reserves too small for conventional worldscale LNG development. It is also suitable to monetize associated gas from oil production, yielding LNG as a by-product while avoiding flaring. In addition, mid-scale LNG could be a solution for markets where demand is not centralized or pipeline infrastructure may be non-existent, uneconomic or too difficult to develop. It is increasingly viewed as a potential clean-burning substitute fuel for diesel in smaller-scale power generators and industrial applications, particularly if it can displace liquid fuel imports with domestically sourced gas.

The technology has already established a foothold in some markets. In China, the 0.4 MMt/y Xin Jiang facility has operated since 2004, providing LNG for distribution by tank truck to nearby power generation and industrial users. Similar projects are under development throughout inland China, including a 0.23 MMt/y plant at Dazhou that uses Black and Veatch's PRICO single mixed-refrigerant process and a 2-train 0.8 MMt/y facility at Yinchuan built by French contractor Technip using Air Products SMR liquefaction process. In Norway, two projects liquefy pipeline gas for coastal distribution by small LNG tanker: Gasnor's 0.13 MMt/y facility at Kollsnes near Bergen and the 0.3 MMt/y Nordic LNG plant under construction at Risavika near Stavanger. Other mid-scale plants in advanced development include LNG Ltd's 1.3 MMt/y Fisherman's Landing export project in Queensland, Australia and EWC's four-train 2.0 MMt/y Sengkang project in Sulawesi, Indonesia.

Mid-size plants face challenges in terms of economies of scale when compared to larger facilities, but have characteristics that offset some of this disadvantage. The smaller stranded gas reserves suitable for mid-scale development can likely be accessed at a lower cost than large-scale resources. Projects small enough to be supplied from non-dedicated pipeline networks will require minimal investment in additional feedgas pretreatment. Mid-scale plants should have shorter development and construction schedules, reducing time to market. But most of the positive trade-offs for small facilities center on use of simpler liquefaction processes. Mid-scale plants typically use liquefaction processes that require less equipment with reduced operational complexity and lower maintenance burdens. This increases the range of liquefaction technologies, equipment vendors and qualified engineering and construction resources available to the project, creating stronger bidding competition than is typical for more demanding and costly large-scale developments.

Recent and Upcoming Mid-Scale Liquefaction Projects

Location	Project	Capacity	Status	Liquefaction Process
Australia	Fisherman's Landing	1.3	FEED	OSMR (LNGTech)
Brazil	White Martins	0.1	Operating	PRICO (B&V)
China	Xin Jiang	0.43	Operating	Adv. Single Flow (Linde)
China	Dazhou	0.23	Under Construction	PRICO (B&V)
China	Ordos LNG 1	0.23	Under Construction	PRICO (B&V)
China	Jingbiang	0.12	Under Construction	PRICO (B&V)
China	Zhuhai (CNOOC)	1.4	Under Construction	PRICO (B&V)
China	Wuxi Yongda	0.16	Under Construction	Unknown
China	Yinchuan	0.8 (2 x 0.4)	Under Construction	AP-M (Air Products)
Indonesia	Sengkang	2.0 (4 x 0.5)	Under Construction	Chart SMR
Norway	Kollsnes I & II	0.13	Operating	Chart SMR
Norway	Nordic LNG	0.3	Under Construction	Adv. Single Flow (Linde)

Sources: Repsol, Zeus Development, Poten & Partners

The smaller plant size also increases available choices for equipment drivers, allowing the venture to consider a wide range of gas turbine vendors or the potential use of electric motors. Smaller scale also means that the plant may be able to draw power requirements from the existing grid rather than needing dedicated power generation capability, while plot space requirements are also an order of magnitude smaller than larger-scale LNG facilities. Finally, modular construction becomes distinctly more viable with smaller facilities. More yards are capable of building these smaller modules and more equipment is capable of lifting and transporting them.

Mid-scale facilities and their likely applications do harbor some risks. Perhaps the greatest disadvantage is when the facility uses conventionally-sized LNG shipping, as this increases storage and loading requirements far above the logistical minimum. Mid-scale LNG chains that use trucking or smaller ships to reach their markets will have sharply lower storage and loading costs. Plants with pipeline gas feeds will also not derive any revenue from associated liquids; conversely, they will not need equipment to separate and stabilize these by-product streams. Associated gas-based projects face uncertainty around feedgas supply, particularly during the depletion phase of the target oil field's life. For these projects, non-economic drivers such as avoidance of flaring and development of local gas markets may be needed to defray some economic risk.

While much about mid-scale plants is simpler and more uniform than large LNG projects, configurations and economics do vary widely. Capital costs at a given capacity depend strongly on pretreatment demands and the sendout requirements for the target market. Attainable pricing also depends on the target end-market. If a project intends to sell output internationally, it will compete against other LNG projects. But if the project targets domestic energy demand, it is more likely to displace liquid fuels. Capital cost information so far is limited. Linde's first-pass EPC cost data puts a 0.3 MMt/y plant at somewhere around $750 to $1,100 per ton of annual capacity, with a larger 1.0 MMt/y facility coming in around $500 to $700 per ton. Repsol's preliminary economics for a 1.0 MMt/y plant are based on $1,100 per ton. Clearly more data will be needed. Nevertheless, the smaller scale and reduced timelines for mid-sized LNG make it more likely that EPC contracts will be bid on a lump sum, turn-key basis, reducing the developer's capital cost risk exposure.