FLNG



he first successful floating LNG (FLNG) redeployment and start-up of the PFLNG-Satu FLNG unit from the Petronasoperated Kanowit field off Sarawak to the Kebabangan field in block J off Sabah in May 2019 supports the viability of redeployment opportunities, unlocking huge market potential for stranded gas. As seen with conventional floating production, storage and offloading vessels (FPSOs), factors including reservoir characteristics, flowrate, water depth and weather conditions are some of the many challenges associated with unit redeployments. However, the cost-benefit of having to carry out minor refurbishments when needed and the replacement of mooring systems for such capitalintensive projects represents a significant shift in the investment required for an FLNG development.

Continued growth in gas demand will underpin capital expenditure (capex) in the floating liquefaction market over 2019– 2025 and beyond, as Westwood analysis forecasts that investment

in FLNG units will total \$20.7bn over the period. This investment in floating liquefaction vessels is due to several gas discoveries in areas with limited onshore facilities to support supplies for the export market, such as New Age's Etinde fields offshore Cameron, Petronas' Boudji discovery off Gabon and Kosmos Energy's Yakaar field off Senegal. In addition to the significant investment seen with land-based liquefaction facilities, the FLNG market is also expected to experience a wave of investment in the near-term, as operators now consider nearshore, small, or medium-scale LNG development concepts as attractive propositions to achieve first gas.

Driving project sanctions

Several drivers, including the growth in gas demand and cost reduction in the supply chain as a result of improvement in industry collaboration, will support an increase in project sanctioning over the next 24 months. This market sentiment is also shared by Martin Hruska, Director of the Floating

Facilities Solutions Group at Wison Offshore & Marine, in the US, who states that: 'Market projections indicate that, with the continued increase in demand for natural gas from growth countries such as India and China, the pendulum is set to swing by the early 2020s, requiring more production of LNG and thereby new opportunities for FLNG projects.'Despite the positive outlook, there have been several drawbacks in terms of the commercial viability of projects, which resulted in the cancellation of the Fortuna FLNG project off Equatorial Guinea in October 2018, with a downward revision of approximately \$1.5bn in conversion costs on the supply chain.

Things were looking on track for the Steelhead Kwispaa LNG project, with the front-end engineering design (FEED) contract having been awarded to Hyundai Heavy Industries in September 2018. However, project work was halted in February 2019 due to concerns over the construction of new oil

PFLNG-Satu FLNG unit Photo: Petronas **4** p24

'Cost control must be in place for [FLNG] projects to take FID and move forwar<u>d.</u>'

Martin Hruska, **Director, Floating Facilities Solutions** Group, Wison **Offshore & Marine** and gas pipelines and the rights of Canada's indigenous communities (see pp14–16). The February 2019 suspension of the Steelhead Kwispaa LNG project, which was expected to export up to 24mn t/y, will impact the supply chain at an estimated value of over \$13.8bn.

Gaining traction

Overall, Westwood expects the floating liquefaction sector to continue to gain traction following the successful start-up and operation of the initial newbuild and converted liquefaction vessels, which serves as a boost to investors' confidence. This has triggered a sense of urgency in several proposed FLNG projects, with 12 additional units expected to be operational by the end of the forecast. However, Hruska has warned that: 'Cost control must be in place for projects to take FID [final investment decision] and move forward".

Our own analysis supports this evaluation. Despite an increase in the number of units expected to be installed over the forecast, FLNG projects are expected to benefit from lower supply chain costs, with units sanctioned over the 2019-2025 period anticipated to have a cost per unit liquefaction capacity averaging at \$542/t/y for newbuild units. This represents a 70% decline compared to the average of \$1,909/t/y for newbuild units sanctioned pre-2019. It is important to note that the disparity in cost is heavily impacted by Shell's prelude FLNG unit (which shipped its first LNG cargo in June 2019) with a production capacity of 3.6mn t/y plus 1.3mn t/y of condensate and 0.4mn t/y of LPG.

Overall, Africa will account for 43% of the market, with expenditure totalling \$11.7bn over



New Age is also planning to use an FLNG unit to develop gas reserves at the Etinde block off Cameroon, with FID expected late in 2019 or 1Q2020. An SBM-JGC consortium was awarded a design, engineer and build contract with a unit capacity of 1.4mn t/y, with contract execution dependent on project FID.

Historically, there has been a lack of traction for FLNG units in the US. However, the shale gas revolution is expected to support the use of floating liquefaction vessels in the US over the forecast period. North America is expected to have its first set of liquefaction vessels installed, with associated expenditure totalling \$9.3bn. Delfin FLNG and Main Pass Energy Hub will account for the majority of US expenditure over the 2019–2025 period. In 3Q2018, Wison Offshore & Marine was awarded the FEED contract for the Western FLNG project off Canada and will take on the EPC contract if the project is sanctioned.

As China hikes tariffs on US gas imports as a result of the ongoing



trade stand-off, concerns remain over the economic viability of US FLNG projects, as the 25% import duty will make them less competitive. In view of this, any significant delays or cancellations to these projects would represent a downside risk to Westwood's FLNG forecast as only a handful of projects are driving expenditure in the region over the forecast period,

Meanwhile, many FLNG projects in Australasia have been shelved in recent years. However, there seems to have been a resurgence and an appetite for small-scale FLNG units, with Transborders Energy planning to deploy an FLNG unit off Australia with an export capacity of 1.2mn t/y by 2025. Furthermore, Western Gas' Equus project, located in the Carnarvon Basin, is expected to utilise a nearshore LNG facility with a capacity of 2mn t/y. These development concepts in Australia, Canada and Mauritania further highlight the opportunities for small to midscale nearshore and at-shore FLNG solutions.

Market upside

There is also an upside to the FLNG market. Major challenges to most FLNG projects, including offtake contracts and project financing, can be mitigated as growing gas demand will support the commercial viability of several projects that are currently speculative.

Furthermore, the supply chain is providing innovative methods to help improve project economics, and substantial cost savings can be made through standardising the approach to engineering and design. Notably, the supply chain is looking at standardised hulls and modules, which will help reduce development timelines and further improve the attractiveness of FLNG as a development solution.

In addition, according to Hruska: 'Regulators will need to refine their approach and challenge themselves to not over-burden these projects with unfettered requirements but instead focus on ensuring that these facilities are constructed and operated in a manner safe for the people operating them, living around them, as well as the environment.'

Looking forward, exploratory success in places such as the Cayar Offshore Profond blocks off Senegal, and the substantial gas reserves in block 2 offshore Tanzania in the East African basin, will provide additional opportunities for the deployment of FLNG units beyond 2025. ●