First US LNG bunker barge project gains momentum

Houston-based LNG America has spent its first year putting into place the strategic assets that will support the growth of LNG as fuel for the marine communities operating on the Gulf Coast and beyond.

In May, LNG America selected the American Bureau of Shipping (ABS) to class North America's first LNG bunker barge, a 3,000 cu m unit being designed by Seattle-based Jensen Maritime, a subsidiary of the Crowley Maritime Corp.

"Our concept utilises distributed LNG, providing LNG where needed, when needed and in the quantity needed," said LNG America's president and CEO, Keith Meyer. "In order to service the marine market, there was a need to have a bunker/shuttle barge as part of our logistics network. The barge will have the capability to deliver LNG to our marine-based LNG storage facilities as well as provide ship-to-ship bunkering services."

LNG America conducted an in-depth feasibility study to determine the commercial viability of North American LNG as a global marine and high-horsepower fuel. With domestic supply expanding, there appeared to be no technical or market-driven reasons why the growth of LNG bunkering assets in Europe and elsewhere wouldn't migrate to the US.

LNG America president and CEO Keith Meyer.

The sector just needed a kick-start, companies willing to invest in the infrastructure to make LNG as a bunker fuel available.

"The industry is in a classic chicken or egg syndrome: Without the ability to refuel with LNG, shipowners and builders are wary of taking the step toward conversion,"

Meyer said. "Our network of LNG storage depots and emerging delivery infrastructure, including LNG bunker barges, will help to provide marine and other fuel-users with the confidence that LNG will be available on a reliable basis, taking some of the risk out of the decision to convert."

The current expectation is for the first barge to be deployed in the US Gulf, where LNG America has a large supply position. However, Meyer said demand was also appearing on the other US coasts and that LNG America would provide service in those areas as demand warrants.

TRADITIONAL BUNKERING

While LNG America has yet to officially unveil the design, it will make LNG bunkering work like traditional product bunkering, allowing fuel buyers to make as few operating changes as possible. The design was developed with the basic ideas that the barge needed to be safe and able to function with ship-to-ship and ship-to-shore capabilities.

"It needed to be able to carry enough LNG to meet a vessel's demand and have the ability to be operated on any of [the US.] four coasts, meaning the vessel had to be compliant with the Jones Act, allowing it to work between US ports," Meyer explained. "We also looked at the practical design requirements to make sure that we would have the best possible outcomes for stability and draft."

As a virtually new asset class, LNG bunkering barges face several challenges from the technical and regulatory perspectives, elements such as new vessel specifications and service requirements, bunkering practices to transfer the LNG from the barge to gas-fueled ships and the development of new regulations surrounding the transport of LNG by barge.

From a regulatory perspective, the transport of LNG as a cargo has a 50-year history. Classification rules, international regulations and flag-state requirements that support the ship design, construction and service of the vessels are mature. For gas carriers, the IMO's International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk (IGC Code) applies to deepsea ships, but not to barges, which are not self-propelled and/or which commonly do not operate on international voyages.

As such, the designer, shipyard and owner will need to rely on class requirements and flag-state regulations and/or policies, said Roy Bleiberg, ABS' director, Gas Solutions.

The ABS Rules for Building and Classing Steel Barges are applicable to LNG tank barges. There are several liquefied gas tank barges in service; many are US-flagged. Most, however, transport liquefied petroleum gas, not LNG.

For US-flagged tank barges, the regulations are well defined for oil and chemical tank barges, but not necessarily for tank barges transporting LNG, Bleiberg said.

"The US Coast Guard is actively addressing the need for regulations to support industry. Although the current US regulations for LNG carriers and the IGC Code may be used as the starting point, many regulations are not practical or are not applicable to tank barges," he said. "Fundamentally, however, these safety concepts are proven and effective to promote

ABS director Gas Solutions Roy Bleiberg.

safety. So it is envisioned that flag administrations will establish requirements based on these principles."

CONTAINMENT SYSTEM

One of the first decisions that will need to be made when designing an LNG bunker barge is to determine which containment system will be employed. This will have a wide-ranging impact on many elements of the barge design, including the vessel arrangement, inspection access and what operating equipment will be required.

LNG America chose an IMO Type 'C' independent tank containment system. Type 'C' independent tanks are vessels designed for pressures generally greater than 2 bar, and are cylindrical, or bi-lobed, in shape.

From the class perspective, the design and certification of these cryogenic pressure vessels is a well-understood process. ABS engineers perform a design review on the tanks; they review the plans in light of the rules and recognised standards, validate the analysis and assumptions made by the designer and, finally, conduct an independent design assessment of the LNG tanks.

When this is complete, an ABS surveyor bears witness to the fabrication, testing and installation of the tank. However, for US flagged barges, there are still some questions related to the assumptions of the containment-system design.

For example, the 'dynamic-motions' criteria used to design and construct cargo tanks for barges under 46 CFR subchapter D (tank vessels) is very different than what is used for gas carrier design under 46 CFR subchapter O (specific dangerous bulk cargoes), which is based on acceleration components that are determined from the long-term distribution of the vessel's motion and speed.

Also, gas carriers require that a tank must be designed to withstand a 21-day pressure build up due to boil-off without going above the set pressure of the safety-relief valve. Will an LNG bunker barge be required to withstand longer than a 21-day period? Or will its design even have to meet gas carrier requirements?

"These types of regulations for dynamic loads and pressure build up will impact the optimisation of the containment system design and are part of the tank-related challenges that designers will have to face when contemplating the assumptions in the design of their containment system," Bleiberg said.

Other issues still to be clarified include manning, access to the barge from a tug, the level of automation and controls for boil-off gas management and, in some cases, the use of gas-fuelled equipment on board the barge.

Bleiberg said the key to addressing each of the regulatory issues is to develop a mature design based on the principles of the IGC Code, start any discussions with the regulators early and obtain approval before construction begins.

VARIOUS LNGC DESIGNS

Another unique challenge for the LNG bunker barge is that the design of the ships they plan to serve may vary greatly. The transfer pipes and connections have yet to be standardised. The location of and the access to the fuel-loading flanges may vary greatly and vapour management may differ for each vessel.

The relationships between the traditional LNG terminal operators and the LNGC operators are strong and effective; best practices to promote safety are commonly shared throughout the industry with support from organisations such as the Society of International Gas Tanker and Terminal Operators (SIGTTO). Further, ship-to-terminal compatibility, communications, emergency procedures and responses are well defined.

Still, operators of LNG tank-barges and gas-fuelled ships, need to form relationships with open communications, specific and clear procedures and experience so this asset class also can develop and learn from best practices, Bleiberg said.

While LNG bunkering barges constitute a relatively new asset class with some inherent challenges, Meyer pointed out that his company was not reinventing the wheel from an initial design perspective.

"We didn't try to design the prototypical future bunker vessel today – the market will help its evolution over time. The first LNG America barges will serve a dual purpose, both a shuttle vessel delivering LNG to the marine storage depots and as a bunker barge," he said. "In the future, as demand grows, we expect these vessels to be dedicated to single ports and serve primarily as bunker vessels only, with the shuttling service being handled by larger vessels."

As for how many units LNG America may build, that also will be decided by the market.

"Given market adoption of LNG as a preferred bunker fuel there will be a lot of bunker barges and shuttle vessels needed. It's tough to predict how many, or when they will be needed. But it's a sure thing that the shipbuilders, shipowners and operators are interested in lowering their operating costs and that the regulators are placing increasingly strict emissions requirements on them. Both are driving the adoption of LNG as a fuel of choice.

"While we don't know exactly how big or how fast that market will develop, we do know we will be in a position to move with the market and ideally with enough lead time to provide the marine community with the confidence to make the switch to America's clean energy source," Meyer concluded. ■

The barge will be fitted with an IMO Type 'C' independent tank containment system.