# Supply revolution: waiting but not wanting

## Mid-term supply solutions may bridge the gap while LNG infrastructure and gas-ready ship orders grow

Angus Campbell, corporate director of energy projects at Bernhard Schulte Shipmanagement (BSM), discusses a new gas supply vessel (GSV) design and how vessels of its kind will facilitate the practical adoption of LNG fuel in an exclusive Q&A with *The Naval Architect*.

**NA: How will GSVs fit into the wider adoption of LNG?**

AC: We view GSVs as a critical component of the infrastructure needed to allow the shipping industry to utilise a cleaner burning fuel. Until the number of ships ready to burn gas as a primary fuel increases, acceptable utilisation will be a commercial hurdle that we need to overcome. Because of this, our newly designed GSV will be able to function as a highly capable fuelling vessel, but will also be able to tranship LNG to other shore-based users. As to the wider adoption of LNG as a marine fuel, each GSV will increase fuel availability and build confidence in the end user's mind that resupply will be available where and when it is needed to support the venture.

**NA: What infrastructure is needed to support vessels of this type and wider LNG logistics?**

AC: The best way to explain this is to use the analogy of infrastructure changes needed when the shipping industry moved from using wind for propulsion to using coal, followed by the more recent transition from coal to oil.

In both cases, new 'bunkering' infrastructure was necessary to support the change. As we move from oil to liquefied natural gas, the cryogenic storage and small ship loading facilities in major bunkering centres around the world will be needed once again. Investment on this scale will take time,

Angus Campbell, BSM

so for the foreseeable future we believe that GSVs that can serve a region rather than just a single port will be called for. As mentioned before, this will also help to increase utilisation and make the service commercially viable. Small ship loading facilities are being developed in many terminals to allow LNG bunkering vessels like the GSV to lie alongside safely. Many LNG terminals were designed for larger ships, with fendering and manifold height designed accordingly.

**NA: Who has collaborated on the design?**

AC: The design has involved a number of world class companies. In addition to Babcock Schulte Energy (BSE) which harnesses the expertise of Schulte Group and Babcock (including Babcock LGE Process), the conceptual design was developed by BMT TITRON.

BMT TITRON fully supported the design. This support ranged from work on the original concept, including design to Class requirements for the first, Black Sea and Danube-tailored design (a design that has not gone ahead), through to the current GSV whereby the detailed design was taken over by the current builder. This design is now coming to fruition because of the skill of Hyundai Mipo Dockyard (HMD) in the construction phase. As you can imagine, the first-in-class design is evolving as we progress using the combined experience of the parties involved.

**NA: What is innovative about it?**

AC: We have used a fresh design approach. It not only operates safely, efficiently and with high manoeuvrability, but also ensures that all boil off and flash gas generated during fuel transfer is retained onboard the GSV. This stored gas is then compressed and used as fuel to produce power in an effort to reduce fugitive emissions to zero, protecting the environment. The design has also removed the need for ballast exchange, using trim tanks with passivated water only.

The GSV will be classed by Lloyd's Register, possess Ice Class 1A FS, and will be fully compliant with the revised IGC Code. Its main dimensions are 117m LOA, 20m beam and design draught 5.2m salt water. Cargo capacity in two independent Type C tanks is about 7,500m$^3$. Twin azimuthing thrusters aft and twin bow thrusters forward will provide excellent manoeuvrability and dynamic positioning capability.

As the LNG fuelling sector evolves it will have to operate while the receiving ship is conducting simultaneous operations. This may be cargo operations or the embarkation of passengers and freight. Such factors must, as far as possible, be addressed at the design stage to mitigate risk and ensure maximum operational flexibility. New access challenges must also be addressed to allow fuel transfer between many different types of LNG fuelled vessel. Maintaining schedule will be critical to many customers, so fuel

transfer rates can be adjusted to match the capability and requirements of the receiving vessel.

**NA: Where are you in the design process?**

AC: We are presently in the detailed design stage with HMD and are nearing maturity with tank testing complete. Plan approval is progressing and we are preparing for steel cutting in the next month or so. Cargo tank construction is already underway and the GSV is scheduled for delivery in late summer 2018.

**NA: How has the design changed and developed since conception?**

AC: The design has certainly changed from its initial conception following the influence of specific project requirements and the demands of potential customers.

Originally, the GSV was of traditional small gas carrier form, with aft accommodation and type C tanks under a trunk deck similar to a semi-pressurised Ethylene Carrier. It was intended for the Black Sea/Danube project mentioned earlier and had to comply with a number of physical restrictions:

1. Pure Gas burning, no liquid fuel onboard except for emergency purposes
2. Environmentally friendly – as mentioned, zero methane emissions during LNG transfer
3. Capable of deep sea navigation (Mediterranean and Black Sea winter conditions) as well as river and canal systems, i.e. shallow draught

Some canal locks and potential ports placed constraints on the length of the GSV, which caused an issue with forward visibility over the cargo tanks to meet SOLAS requirements. This was exacerbated by an increase in capacity from 5,000m³ to 6,000m³ and then to 7,500m³. The solution was to place the accommodation forward, which also provided other benefits. With a better longitudinal balance there was no need for sea water ballast, (some permanent fresh water is used for trim) and this contributed to the environmental credentials required. This arrangement also lent itself to a forward engine room with a power station concept driving twin azimuthing thrusters aft.

In order to take advantage of the commercial benefits of Pilotage and Towage exemptions, enhanced manoeuvring capability was required for the transit of tight places, such as a busy ferry terminal. The standard GSV is DP0 but can easily be upgraded to DP2 as is the case of the vessel presently under construction. It should be noted that our work with existing bunker vessel owners has helped greatly with design improvements for close quarter manoeuvring and for coming alongside and receiving vessels on a regular basis.

An additional innovative design feature, and one that compliments the manoeuvring capability already discussed, is the use of RangeGuard, a product developed by Bernhard Schulte and UK-based DP position measurement technology company Guidance Marine. Originally for the wind farm sector, it is a marine proximity sensor that measures distance to the nearest object. Using radar technology like a car parking sensor, it will enhance the DP0 or DP2 capability to accurately place the GSV alongside tall sided receiving ships with complicated structures, such as the latest generation of cruise vessels.

Another benefit of the power station arrangement is that the main engines are always running during LNG transfer. This enables the GSV in an emergency shutdown (ESD) event to

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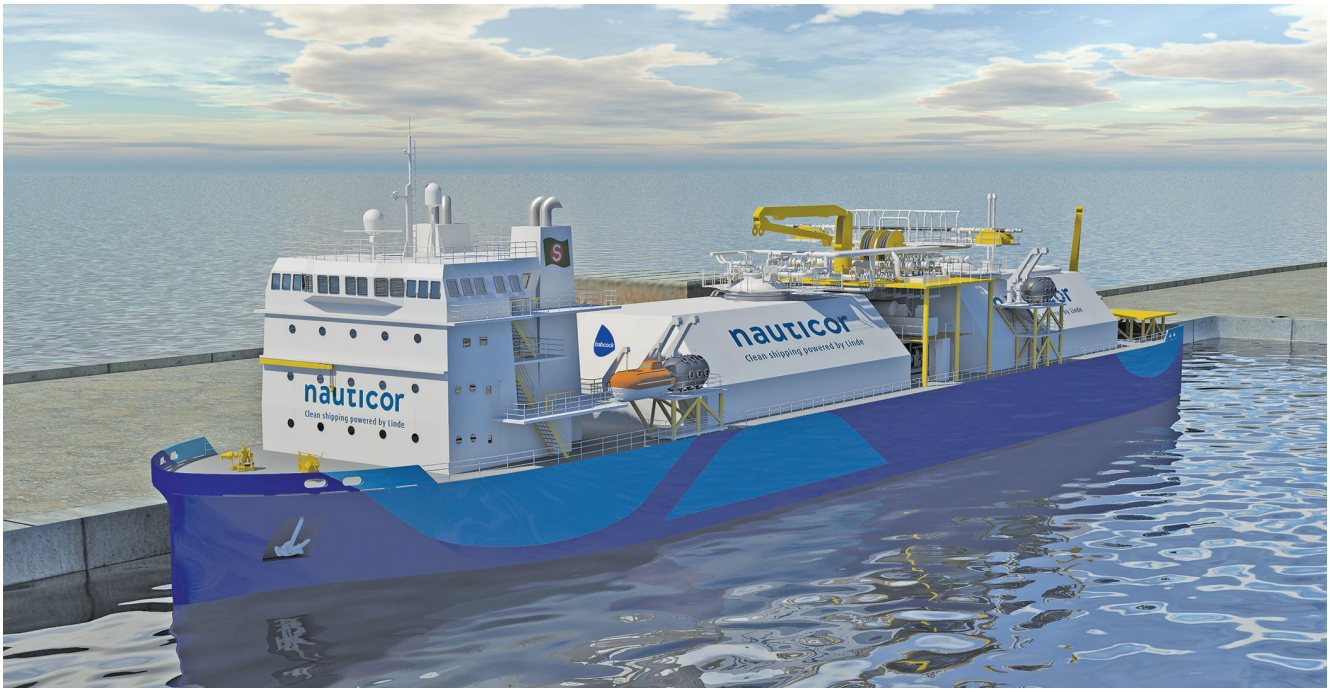

quick release and vector away from the receiving ship as quickly as necessary.

As the current vessel is not required to enter lock systems, the length overall has been allowed to grow slightly to improve hull efficiency. However, to ensure maximum operational flexibility in future designs, we will strive to reduce the dimensions.

Further changes were seen with Wartsila DF engines replacing the Bergen single fuel lean burn engines originally stipulated. This was mainly because of the increased installed power required in a fixed engine room length. When pure gas burning engines were intended, 'get me home' propulsion would have been provided at up to 4knots using the emergency generator via a forward fully azimuthing pump jet. Pure gas burning engines are still an option for any future customers.

A main component of LNG bunkering is the LNG transfer system. It was originally hoped that a system would be developed by one of the existing technology providers and it would be a complete system purchased. Some manufacturers have certainly done this very well, and we continue to keep an eye on them. Unfortunately, with GSV utilisation a key factor, the range of delivery requirements increased the envelope of operation to include up to a receiving manifold of 21m and down to an adjacent shore side facility or truck. After a review of all the available 'Off the Shelf' equipment, none were found suitable, so we decided to develop our own. Using the expertise of BMT TITRON, Babcock LGE and a number of well-known suppliers in the Offshore STS business, a suitable transfer system was developed that includes all the safety features required by current thinking and legislation.

**NA: Can you discuss how the vessel will function in practice?**

AC: Our first priority is the safe operation of the GSV, with no injuries, loss of life, damage to property or the environment. As one of the early movers in this new sector, all our resources will be used to train and select competent and well-motivated seafarers to operate the vessel. This will allow our business partners to achieve their objectives using the unique capabilities of the GSV to deliver LNG reliably throughout the year.

**NA: You mention that the GSV will fuel a variety of vessel types; does the ship owner/operator already have contracts for this? If so, can you reveal them?**

AC: Yes, we are designing the GSV to provide LNG to as many vessel types as possible. This includes the new generation of cruise vessels that may require innovative fendering and other capabilities to come alongside and transfer fuel. As you may know, the first GSV has been time chartered to Nauticor GmbH & Co KG for service in the Baltic region. We have a number of other active projects in progress, but regret we are unable to be more specific for reasons of confidentiality. However, when BSE set out on this course it was not just to build one GSV, so we hope to be able to talk about other projects before long. *NA*