

# Tech in Focus: **Sayaringo STaGE Ships**

*Purpose Built to Serve the U.S. to Japan Shale Gas Trade*

**T**he growing global demand for lower carbon forms of energy and more efficient marine transport is driving the construction and conversion of gas carriers in shipyards across Asia and Europe.

Last month, Mitsubishi Heavy Industries' (MHI) yard in Nagasaki delivered the first 'Sayaringo STaGE' gas ship, a next-generation series of hybrid-propulsion LNG carriers that promise greater unit carrying capacity and better fuel efficiency.

Diamond Gas Orchid was delivered to ABS class on July 3 to owners Diamond LNG Shipping, a joint venture between Mitsubishi Corporation and Nippon Yusen Kabushiki Kaisha (NYK).

The Sayaringo cargo containment system design is a modified version of the one used for MHI's 'Sayaendo' (Japanese for 'podded peas') gas carrier. It features a similar lightweight hull and a containment system that utilizes four MOSS-type tanks housed in a continuous steel cover to reduce wind resistance and reduced steel weight.

But MHI has modified the tanks from their traditional stretched spherical shape to forms that more resemble an apple ('ringo' is Japanese for apple), a shape that expands the tanks' capacity and lowers the center of gravity, increasing stability.

Diamond Gas Orchid is designed with a maximum 165,000 cu. m. of storage capacity, or 6.2% more than its typical Sayaendo predecessors. As the design is flexible, MHI says it is possible to achieve a capacity near 180,000 cu. m. without exceeding the ship-size limitations of the Panama Canal's new locks.

The Sayaringo STaGE ships are purpose built to serve the shale gas trade between Japan and the US Gulf and east coast ports and the stringent environmental demands of the areas where those loading ports are situated.

Another innovative upgrade is found in the propulsion systems of the next-generation ships, in which lightweight twin-skeg hulls were designed to house a hybrid 'steam turbine and gas engines', hence the acronym 'STaGE'.

The propulsion plant combines the Sayaendo model's ultra-steam turbine (UST) with a combination of a dual-fuel diesel engines ([DFE] which work on



Images: ABS

both gas and fuel oil) and a propulsion electric motor (PEM).

The two engines are combined in a way that recovers heat that is typically wasted from the exhaust-gas and jackets of most DFEs; that energy is then used to heat the feedwater for the UST plant, achieving significant improvements in fuel efficiency. The heated feedwater flows to the boiler to generate the steam that drives the turbine.

The electricity generated by the DFEs drives the PEM.

MHI believes the STaGE plant itself emits about 20% less CO<sub>2</sub> than conventional turbine plants. The Sayaringo as a whole emits about 40% less CO<sub>2</sub> per cargo unit than a conventional 147,000 cu. m. LNG carrier with conventional turbine plants, MHI says.

"Diamond Gas Orchid features the latest in marine innovation with its optimized transport capacity, fuel efficiency and environmental performance," ABS Vice President for Japan, Akira Akiyama said in a release announcing the delivery. "Working closely with all of the stakeholders, we were able to help Diamond LNG Shipping demonstrate the viability of the concept and develop a highly efficient and innovative vessel."

ABS was also selected in July to class a floating storage and regasification unit

(FSRU) for BOTAS, Turkey's oil and gas pipeline operator.

To be built at South Korea's Hyundai Heavy Industries shipyard, the ship will have a storage capacity of 170,000m<sup>3</sup> and a LNG discharge capacity of 1,000 million standard cubic feet of gas per day. It will be moored to a jetty off the coast of Turkey and operated by Mitsui O.S.K. Lines.

One of the primary drivers of the current FSRU market is the ships' ability to give LNG importers a faster track to regasification capabilities. At about half the cost of comparable land-based facilities, they offer the flexibility to be relocated as the need for energy changes.

There is currently strong interest among potential LNG importers for solutions based on the use of FSRUs, with many projects in the development phase.

"As demand for gas has increased over the last decade, the supply chain has had to adapt and figure out new ways of getting gas to expanding markets," ABS Senior Vice-President and Chief Business Development Officer, Jamie Smith said in a release announcing the BOTAS deal. "FSRUs, like this one for Turkey, are providing gas distributors and suppliers an efficient and effective solution for getting their product to consumers."

With the spectre of the IMO's manda-

tory sulphur cap on marine fuels on an ever-nearer horizon, gas-capable shipyards are also seeing a rise in LNG conversion activity.

In the first quarter next year, Poland's Remontowa Ship Repair Yard in Gdansk will be delivering the second of two converted 18,747GT passenger ferries to owner B.C. Ferries, based in Vancouver, Canada.

The ABS-classed Spirit of Vancouver Island will join its recently delivered sistership, Spirit of British Columbia, back in service after having its propulsion plant converted to dual fuel (natural gas and marine diesel).

B.C. Ferries expects the conversions to reduce each ship's CO<sub>2</sub> emissions by about 12,500 tons a year.

The comprehensive retrofit will include new engines, a new natural gas fuel system and renewal of the propulsion equipment components, including rudders, the steering system, bow thrusters, propellers and gearboxes.

With lower-carbon fuels increasingly in demand, the world's gas-capable yards are likely to see robust business for the next few years, particularly those whose expertise can run the gamut from conversions and LNG fuelling barges to offshore support vessels and next-generation gas ships.