

LNG Shipping News

AN LNG JOURNAL TITLE ON LNG CARRIERS

23 June 2022

Four energy giants join Qatar's NFE development

QatarEnergy has signed up four energy majors for the Gulf state's North Field East (NFE) expansion project - the world's largest.

ExxonMobil became the fourth energy major to sign up for the project, which was announced on Tuesday.

With NFE, ExxonMobil's participation in Qatar LNG volumes is expected to increase total capacity from 52 to 60 mill tonnes per year.

The US based energy major follows ConocoPhillips, Eni and TotalEnergies to sign up to NFE's giant expansion project.

Each company will participate in four new joint ventures (JVs), in which QatarEnergy will hold a 75% interest with the energy majors holding the remaining 25% interest.

The ExxonMobil JV will own 25% of the entire NFE project, including four LNG trains with a combined nameplate capacity of 32 mill tonnes per year.

NFE's expansion and increased LNG export capacity is one of Qatar's key energy objectives. QatarEnergy is the operator and started the project in 2019. First LNG from NFE is expected in 2025.

Earlier, ConocoPhillips had become the latest company to join the project and followed earlier agreements signed with TotalEnergies and Eni.

Each of the four JVs will be responsible for the equivalent of four trains for a period of 27 years.

Once operational, this huge project will expand Qatar's LNG export capacity from 77 mill

tonnes per annum at present to 110 mill tonnes.

Reported to be costing around \$28.75 bill, the new project will deploy technologies to minimise the overall carbon footprint, including carbon capture and sequestration.



The second NFE signing involved Eni CEO Claudio Descalzi and Qatari Minister and QatarEnergy President and CEO HE Saad Sherida Al-Kaabi

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Freeport to return to full operations later this year

Freeport LNG has declared *force majeure* until at least September, following an incident at its Quintana Island, Texas LNG export plant, which has ceased loading operations.

Due to the 8th June fire at Freeport LNG's export terminal on Quintana Island, Texas, full plant operations are not expected to resume until late this year, the operator revealed last week.

Given the relatively contained area of the facility physically impacted by the incident, a resumption of partial operations is possible in about 90 days, once safety and security can be assured and all regulatory clearances are obtained.

Freeport LNG said that an incident at the liquefaction plant resulted in the release of LNG, which led to the formation and ignition of a natural gas vapour cloud, and subsequent fire at the facility.

There were no injuries, and at no time did the incident pose a threat to the surrounding community, the operator claimed.

In accordance with Freeport LNG's safety design parameters, the LNG vapour cloud dispersion and ignition were contained within the fence line of the liquefaction facility and lasted about 10 secs.

With the assistance of local area emergency response personnel, the fire was extinguished about 40 mins after the initial incident.

While the burning of materials resulted in carbon monoxide, nitrous oxide, particulate matter, sulphur dioxide and volatile organic compound emissions, they

were of limited quantity, due to the short duration of the fire and not at levels that posed any immediate risk to on site personnel or the surrounding community.

There was no release of any other chemicals or substances from the plant during the event, the operator said.

Water used to suppress the fire was captured on site, and will be tested and confirmed free of any harmful contaminants before being released or removed for proper disposal.

Pipe racks

The incident occurred in pipe racks that support the transfer of LNG from the facility's storage

tank area to the terminal's dock facilities located on the intra-coastal (ie, north) side of Freeport LNG's dock basin.

None of the liquefaction trains, LNG storage tanks, dock facilities, or LNG process areas were affected. In co-ordination with local, state and federal officials, Freeport LNG's investigation into the cause of the incident, and what steps are necessary to safely resume liquefaction operations, was underway last week.

Preliminary investigations suggested that the incident resulted from the overpressure and rupture of part of an LNG transfer line, leading to the rapid flashing of LNG and the release and ignition of the natural gas vapour cloud.

Investigations are also underway to determine the events that lead up to the overpressure conditions in the LNG piping.

Freeport LNG provided around 20% of US LNG processing and exported about four cargoes per week before the shutdown.

The Freeport, Texas plant could process up to 2.1 bill cu ft of natural gas per day and at full capacity would export 15 mill tonnes per annum.

Data analysts at consultancy firm ICIS said in a tweet that 68% of Freeport LNG exports in the last three months had been shipped to the European Union and the UK, Reuters reported.

Later it was reported that *force majeure* has been declared until September. ■



Freeport LNG has declared *force majeure* until at least September

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China to continue to spearhead LNG liquefaction capacity additions

China is expected to lead the world's LNG regasification capacity additions between 2022 and 2026.

The country will contribute 26% of the total LNG liquefaction capacity additions, forecast data and analytics company, GlobalData.

GlobalData's latest report, 'LNG Regasification Terminals Capacity and Capital Expenditure (CapEx) Forecast by Region, Countries and Companies including details of New Build and Expansion (Announcements and Cancellations) Projects, 2022-2026', revealed that China is expected to add a newbuild LNG liquefac-

tion capacity of 3,805 bill cu ft by 2026, while expansion projects account for another 2,963 bill cu ft.

Himani Pant Pandey, GlobalData's Oil & Gas Analyst, commented: "In China, 27 newbuild and expansion projects are likely to start operations by 2026. Tangshan II is the largest upcoming project in the country with a capacity of 584.4 bill cu ft by 2026. Yantai I and Zhoushan III are the other major projects with capaci-

ties of 487.0 bill and 340.9 bill cu ft, respectively."

GlobalData said India will be the second-highest contributor to the global LNG regasification capacity additions, with newbuild LNG regasification capacity additions of 2,323 bill cu ft by 2026.

Expansion projects will account for another 1,363 bill cu ft by 2026. The Kakinada GBS Floating and Yanam projects lead India's LNG regasification capacity additions, with capacities of 350.4 bill

and 267.9 bill cu ft, respectively.

Coming third is the Philippines, which is expected to account for 1,820 bill cu ft, of which new-build capacity additions account for 1,060 bill and expansion capacity additions account for the remainder.

Among the newbuild projects in the country, FGEN Batangas Floating is the largest upcoming project with a capacity of 273 bill cu ft. It is expected to start operations this year. ■

Chinese LNG imports fall by a fifth

China's LNG imports fell by 21% from January to May of this year, compared to the same period in 2021, according to Poten & Partners' 'LNG Market Outlook'.

Higher pipeline imports, higher domestic natural gas production, higher coal consumption and production, plus high LNG prices and a slowing economy all contributed to the decline.

Power sector coal consumption from January through April was up 25%, compared to the same time frame in 2020, while coal production rose by about 12%, compared to last year.

Power producers with both gas-fired and coal-fired generation were maximising the coal portion. The switch to coal makes economic sense, due to high natural gas import prices and lower domestic coal prices, Poten said.

Coal prices were lower, due to thermal coal price caps and higher domestic coal production.

The Chinese Government re-

cently announced plans to spend \$1.5 bill on increasing coal fired generation to avoid power cuts, and to spend another \$15 bill on raising coal output.

Given all these factors, the LNG import forecast was lowered to 74 mill tonnes per annum in 2022 from the previous forecast of 77 mill tonnes. Next year, imports are forecast to grow by 11% to 82 mill tonnes per annum.

Imports from Russia through the Power of Siberia pipeline were 60% higher this year. Gazprom sent roughly 9 bill cu m through this pipeline to China in 2021 and has said that it plans to increase flows to 14 bill cu m this year - only about 40% of the pipe's total capacity.

Pipeline gas imports from Myanmar and Central Asia were

offering, creating a complete portfolio for cargo tank needs.

For LNGCs, Scanjet supplies tank venting equipment, uninterruptible power supply and oil discharge monitoring & control system, plus other equipment and services.

Scanjet's technology will complete an offering for every cargo tank need, joining Framo

submersible cargo pumps, Smit inert gas systems and other Alfa Laval solutions.

SCA extends LNGC toll rebates

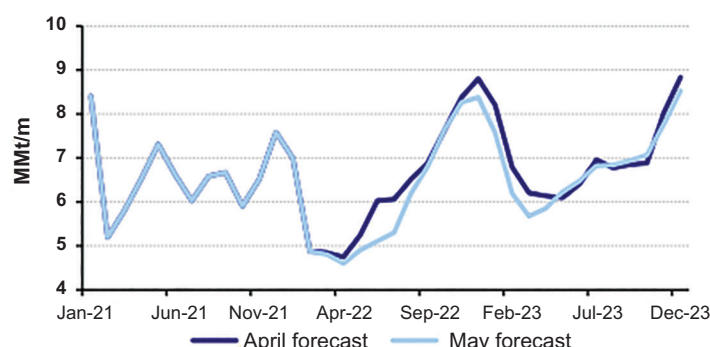
The Suez Canal Authority (SCA) has extended LNGC canal toll rebates from July until the end of the year.

LNGCs operating between the

US Gulf and the Arabian Gulf, ports west of India and at Kochi, will receive a rebate of 30% on the canal's normal tolls, according to a circular.

Those operating from ports east of Kochi to Singapore will receive a rebate of 55% and LNGCs from Singapore ports east will be entitled to a rebate of 70%. ■

China's LNG import forecast



Source: Poten & Partners

also anticipated to increase. However, pipelines running through Myanmar have been targets of anti-Chinese civilian militias.

Through 1Q22, domestic natural gas production was up 5% at 58.5 bill cu m, compared to the same quarter of 2021.

Higher prices have encouraged domestic producers to increase

production, which has exceeded the targets set by the Chinese government.

This trend is forecast to continue throughout 2022 and 2023 with domestic production reaching 230 bill cu m per year in 2022 - up 11% from 2021 and roughly 16 bill cu m higher than the current production targets. ■

NEWS NUDGE

Scanjet to join Alfa Laval's stable

Alfa Laval is to acquire equipment supplier Scanjet.

This deal adds Scanjet's intelligent tank management solutions to Alfa Laval's broad tanker

Naftogaz to buy Canadian LNG

Ukrainian National Joint Stock Company, Naftogaz has signed an agreement with the Canadian energy developer, Symbio Infrastructure to purchase Quebec-produced LNG and green liquid hydrogen (LH2).

"This agreement is an important milestone on Ukraine's path of transitioning to diverse supplies of energy from around the globe, which we began at the end of 2014, when we stopped the direct import of Russian natural gas.

"Since then, we've fortified our energy independence by being an active player in the European energy market. We believe opportunities for procuring reliable, responsibly produced long-term energy supply from allies like Canada - and from Symbio's facilities - by 2027 is critical to our energy security, transition and future economic prosperity," said Yuriy Vitrenko, Naftogaz Ukraine CEO.

Jim Illich, Symbio Infrastruc-

ture Founder and Chairman, added: "Energy from Symbio's innovative, net-zero, hydropower-driven infrastructure will provide competitive energy to Ukraine and will significantly reduce global GHG emissions by displacing higher emission energy sources used in Europe, such as coal, heavy fuel oil, and higher carbon intensity sources of natural gas and LNG."

Both companies signed a Memorandum of Understanding (MoU) on 5th June in Washington (DC). The LNG and LH2 will be delivered to a terminal in a mutually agreed European transit country.

Symbio will supply the world's lowest carbon LNG to Europe thanks to Canada's stringent regu-

latory standards for natural gas production and the innovative use of renewable hydroelectricity to power its facilities, the company said.

Through its subsidiary GNL Québec, Symbio is developing Énergie Saguenay, claimed to be the world's first large-scale, carbon-neutral LNG export facility in Quebec, Canada.

The facility will liquefy and export 10.5 mill tonnes of LNG to Europe (roughly 17 % of Germany's annual gas consumption or about half of Ukraine's consumption) at competitive prices, due to a short transit time to Europe and cost efficiencies gained from Canada's cold climate. ■

NEWS NUDGE

Hudong-Zhonghua selects GTT for another six LNGCs

GTT has announced that it has received an order from Hudong-Zhonghua Shipbuilding (Group) for the tank design of six new LNGCs ordered by an Asian shipowner.

The company will design the tanks for each 174,000 cu m vessel. They will be fitted with the GTT NO96 Super+ membrane containment system.

They are in addition to the first order of six vessels won in January, which will be fitted with the same containment system.

The delivery of the latest vessels is scheduled for the second quarter of 2026 and the second quarter of 2027. ■

Tanzanian LNG export plant takes a step nearer

On 11th June, the Tanzanian Government signed a framework agreement with energy giants Equinor and Shell to supply LNG.

This agreement was aimed at bringing the startup of the \$30 bill LNG export terminal closer.

At a live video from the event, as reported by newswires, Tanzanian Energy Minister, January Makamba, said the signing would pave the way for a final investment decision (FID) on the LNG plant in 2025.

Its construction will take place near huge offshore natural gas discoveries made in deepwater off Tanzania's southern coast. This development has been held up for years by regulatory delays, newswires said.

"Today's step is very important," Makamba said in a speech during the signing ceremony attended by President Samia Suluhu Hassan and officials from the energy companies.

Jared Kuehl, Shell's Vice President and Board Chairman in Tanzania, said: "We believe Tanzania has advantages because it has ...

(a) strategic location and the opportunity to deliver a competitive and investable project."

Equinor, which in 2021 had recorded a \$982 mill writedown on the project, having decided it would not be sufficiently profitably, said in a statement it was too early to say whether it would reverse its decision as a result of the MoU.

Equinor and Shell, plus Exxon Mobil, Ophir Energy and Pavilion Energy, plan to build the LNG plant in the country's Lindi region.

According to Reuters' information, Equinor operates Tanzania's Block 2, in which Exxon Mobil also holds a stake. It is estimated to hold more than 20 trill cu ft of gas.

Equinor aims to work on the LNG project with Shell, which operates Block 1 and Block 4, which contains 16 trill cu ft estimated recoverable gas. ■

EU to import Israeli and Egyptian LNG

Israel and Egypt signed a memorandum of understanding (MoU) last week aimed at exporting LNG to the European Union (EU).

This framework deal will be the first that allows significant exports of Israeli gas to Europe, according to Israel's energy ministry.

Under the MoU, the EU will encourage European companies to participate in Israeli and Egyptian exploration tenders, the ministry said.

Some Israeli gas is already shipped by pipeline to Egyptian liquefaction plants on the Mediterranean coast, from where it is re-exported as LNG.

Officials, talking with newswires, said that they expect Egyptian LNG shipments to Europe to increase under this agreement, but they also said, it would probably take a couple of years.

Egypt also produces gas, but exports were limited by rising domestic demand.

"Egypt and Israel make a commitment to share our natural gas with Europe and to help with the energy crisis," Israeli Energy Minis-

ter, Karine Elharrar said after the signing of the MoU in Cairo.

Egypt exported 8.9 bill cu m of LNG last year and 4.7 bill in the first five months of 2022, according to Refinitiv Eikon data, the majority going to Asia.

In the next few years, Israel is on course to double gas output to about 40 bill cu m a year, as it expands projects and brings new fields online, industry officials told Reuters.

The EU imported 155 bill cu m of gas from Russia last year, accounting for about 40% of the bloc's overall consumption, which needs replacing.

The MoU was signed as Egypt hosted the East Mediterranean Gas Forum, a group established in 2020 that aims to boost gas trades between regional states, including Israel, Greece, Cyprus and Jordan, and during a visit to Cairo by European Commission (EC) President, Ursula von der Leyen. ■

FIDs and SPAs signed

There was at least one FID and several SPAs reported recently involving US LNG exporters.

Cheniere Energy took a positive Financial Investment Decision (FID) on its 10 mill plus tonnes per annum Corpus Christi Stage 3 Liquefaction Project (CCL Stage 3) this week.

A full notice to proceed was also issued to Bechtel Energy to continue its construction, which began earlier this year.

On 15th June, Cheniere's wholly-owned subsidiary, Cheniere Corpus Christi Holdings (CCH) agreed an amended and restated around \$4 bill senior secured term loan, due 2029, as well as an amended, extended and increased \$1.5 bill working capital facility, due 2027.

In conjunction with the financing, Cheniere contributed its wholly-owned equity interests in Corpus Christi Liquefaction Stage III to CCH, and merged CCL Stage III

into Corpus Christi Liquefaction (CCL), a subsidiary of CCH. CCL will continue as the surviving company.

In addition, two Cheniere subsidiaries, Sabine Pass Liquefaction (SPL) and Cheniere Marketing, each entered into long-term LNG sale and purchase agreement (SPA) with Chevron USA.

Chevron will purchase a combined 2 mill tonnes per annum of LNG, subject to certain conditions.

Under the first SPA, Chevron will purchase around 1 mill tonnes per annum of LNG from SPL on a free-on-board (FOB) basis. Deliveries will begin in 2026, reaching the full 1 mill tonnes during 2027 and continue until mid-2042.

In the second SPA, Chevron will buy the same amount from Cheniere Marketing on an FOB basis with deliveries beginning in 2027, continuing for around 15 years.

Sabine Pass LNG (SPLNG) and Chevron have also agreed terms for the early termination of their LNG terminal use agreement in return for a lump sum payment to SPLNG during this calendar year.

More SPAs

Earlier, Cheniere Marketing had signed an SPA with Norwegian energy giant Equinor.

Equinor will purchase around 1.75 mill tonnes per annum of LNG on an FOB basis for about 15 years.

Deliveries are due to start in the second half of 2026 and reach the full volume in the second half of 2027.

In another move, Cheniere Energy has agreed to repurchase about \$350 mill of the company's common shares beneficially owned by Carl Icahn and certain of his affiliates.

Meanwhile, Venture Global LNG and EnBW have signed two long-term SPAs for 1.5 mill tonnes per annum of LNG from the Plaquemines and CP2 facilities, starting 2026.

Under the agreement, EnBW will purchase 0.75 mill tonnes from each project for 20 years.

In yet another deal, Semptra Infrastructure and INEOS Energy Trading have signed a heads of agreement (HOA) for the long-term supply of LNG from Semptra's Gulf Coast LNG projects currently under development.

This HOA provides the framework for the negotiation and finalisation of a definitive 20-year LNG SPA for about 1.4 mill tonnes per annum of LNG delivered FOB from the proposed Port Arthur LNG project, or Cameron LNG Phase 2 project. ■

Italian offshore LNG terminals auction capacities

Both Italian offshore receiving terminals have updated the status of their capacity auctions.

First, OLT Offshore LNG Toscana's auctions for the allocation of continuous regasification capacity were successfully concluded on 10th June, 2022.

This concerned the multi-year allocation processes with expres-

sion of interest required for gas years 2022/2023 to 2032/2033.

Regasification capacity was offered in slots of 155,000 cu m. During the process, 34 slots were allocated for each gas year starting from 2023/2024 until 2026/2027.

Overall, 83% of the authorised annual capacity was allocated for each year, equal to around 3.2 bill cu m. In addition, all the available capacity for 2022/2023, equal to 33 slots, was allocated.

Second, Adriatic LNG, which operates Italy's largest LNG regasification terminal has launched an accreditation phase for the 'Open Season 2022'.

This process allows European and international operators to bid in the auction sessions for regasification capacity allocation for October, 2022/December, 2047.

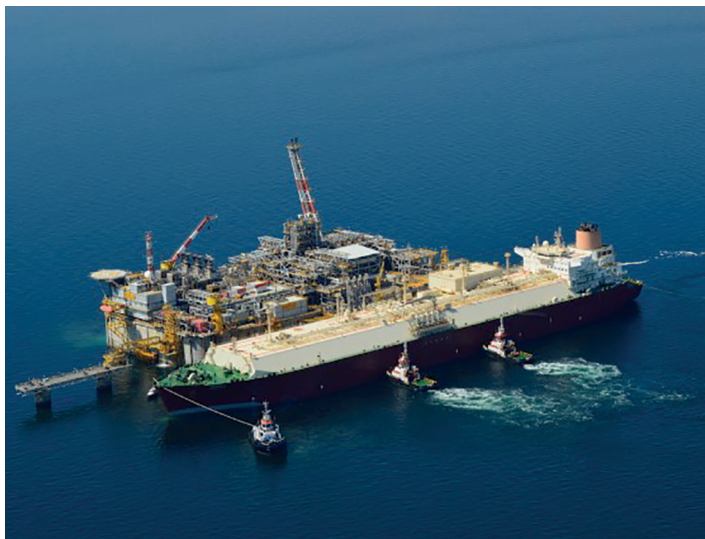
Operators may apply until 5th July, 2022, for accreditation to participate in the binding phase of the open season, which will start on 11th July, ending on 29th July, during which, two sessions will be organised.

Given an overall LNG regasification capacity of about 147 bill

cu m of natural gas, this open season is an opportunity to increase national and European LNG imports while, at the same time, diversify gas supply sources, the company claimed.

The terminal operator said that it had also implemented recent measures introduced by the Italian Regulatory Authority for Energy Networks and Environment on entry costs to limit operator risks, due to the variation of transportation tariffs beyond the current regulatory period.

Furthermore for the open season, Adriatic LNG is conducting two market surveys on the potential operator interest in the possible development of: (i) new regasification capacity (from 0.5 bill cu m to 2 bill per year); (ii) Wobbe Index correction service to increase the the supply sources from which the LNG is received. ■



A Q-Flex seen alongside the Adriatic offshore terminal

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LNGC to be used for carbon capture trials

ABS, Daewoo Shipbuilding and Marine Engineering (DSME) and GasLog are to work together to develop an on board CO₂ capture and storage system (OCCS).

The three companies signed a joint development project (JDP) at the recent Posidonia Exhibition.

This technology will return CO₂ from the exhaust gas back to the ship for storage by absorption, regeneration and separation. The stored CO₂, as a form of byproduct, can then be safely offloaded to shoreside facilities located at a port.

The companies will collaborate on the design of an optimal OCCS for a DSME built LNGC and verify the system through various risk analyses and tests before installation and operation.

At the same time, ABS will assess the project to possibly obtain approval in principle (AIP) for the OCCS system.

The JDP is scheduled to be

complete by the first quarter of 2023.

ABS will guide the OCCS rules and regulations development and provide technical advice and support. In particular, the class society will conduct risk assessments and supervise the assessment procedure for the final AIP for the technology.

Four ship order

DSME received an order for four LNGCs from GasLog last year. They are scheduled to be delivered from the first half of 2024 onward. The OCCS installation on the LNGC selected is aimed to coincide with her construction.

GasLog will undertake the technical requirements for the OCCS' installation and operation

The company will also provide shipmanagement know-how necessary for OCCS design evaluation.

"Carbon capture on board is going to be a critical technology in the industry's push for net zero. We are proud to be able to use our insight into OCCS to support these industry leaders with this landmark project, which promises to materially advance the adoption of this technology at sea," said John McDonald, ABS Executive Vice President and COO.

Mr Karathanos, GasLog COO, added: "Strong collaborations with industry leaders, such as DSME and ABS, is a key enabler to de-carbonising shipping. At GasLog we firmly believe that on board car-

bon capture will become one of the main methods to reduce emissions from shipping and contribute to keeping global temperature increase to 1.5 deg C."

A DSME spokesperson commented: "We are pleased to establish a place for environment-friendly technical cooperation in Greece, which is one of our biggest customers in the shipbuilding industry."

ABS has also published a whitepaper: 'Carbon Capture, Utilisation and Storage', which explores the technology's potential, gives an overview of the current technology, evaluates opportunities for utilisation of carbon and for its storage, as well as the vessels required to carry the liquefied product. ■

'Coral Sul' receives first hydrocarbons

Mozambique's Coral South project has introduced the first hydrocarbons to the FLNG 'Coral Sul' from the Coral South reservoir offshore.

Eni, as upstream delegated operator of Area 4 on behalf of its partners ExxonMobil, CNPC, GALP, KOGAS and ENH, said that the FLNG will be ready to achieve its first LNG cargo in the second half of this year, which adds Mozambique to the list of LNG-producing countries.

Hydrocarbons introduction comes after the safe and timely conclusion of the offshore commissioning activities, Eni said. 'Coral Sul' arrived at her operating site offshore Mozambique in early January, 2022; mooring and connection to six underwater production wells were finalised in March and May 2022, respectively.

'Coral Sul' was brought into service with an energy optimisation approach integrated in the design via a systematic analysis of energy efficiency improvements.

These included among others, zero flaring during normal operations, use of thermal efficient aero-derivative gas turbines for

refrigerant compressors and generation, use of dry low NO_x technology to reduce NO_x emission and waste heat recovery systems for the processing.

The FLNG is 432 m long and 66 m wide, weighs around 220,000 tonnes and has the capacity to accommodate up to 350 people in an eight-story living quarter module.

She is located at a water-depth of around 2,000 m and is kept in position by using 20 mooring lines that weigh a total of 9,000 tonnes.

'Coral Sul' has a gas liquefaction capacity of 3.4 mill tonnes per year and will put in production 450 bill cu m of gas from the giant Coral reservoir, located in the offshore Rovuma Basin. ■



The FLNG 'Coral Sul' has started to load hydrocarbons

NEWS NUDGE

First Gen wants permit validity extension

First Gen Corp said last week that its subsidiary, FGEN LNG Corp had requested that the Philippines Energy department extend the validity of its permit to build its interim offshore terminal for imported LNG.

FGEN LNG made the request to extend the permit to 23rd March, 2023 from this September, the previous validity date of a permit to construct, expand, rehabilitate and modify the proposed facility.

FGEN LNG and the provider of its FSRU, BW FSRU IV, had agreed to move the delivery of the vessel to the second or early third quarter of next year.

The delivery was previously set for 1Q23. ■

Wison to co-operate with ABB on FLNGs

Wison Offshore & Marine (WOM) and ABB Engineering (Shanghai) have signed a Memorandum of Understanding (MOU) to co-operate on FLNG project development and implementation worldwide.

As a technology and solution provider focusing on clean energy, WOM claimed to have significant experience in design and construction of FLNGs and standardised LNG plant modules.

ABB has extensive experience in design, manufacturing and systems integration in advanced electrical and automation systems.

This collaboration will create synergy in the commercial promotion of standardised solutions, such as E-house, ICSS, digitalisation and network security for FLNG topsides.

Wom's Assistant President, Wei Huaqing, said that the company is

confident about optimising FLNG standardisation designs through the co-operation with ABB, and together, bring more reliable and economical FLNG standardisation solutions to customers worldwide.

ABB's Group Vice President and head of ABB Energy Industry China business, Li Feng said that with the rich experience in global oil and gas industry, and ability to localise R&D, project design and operations, the company will provide professional technical equipment and services for China's high-quality energy equipment enterprises. ■

ABS verifies SHI's new reliquefaction system

The reliquefaction performance of Samsung Heavy Industries' (SHI) new X-Reli system for low-pressure, dual-gas engines, was verified in testing, which was witnessed by ABS.

This design, which received ABS approval in principle (AIP) for conceptual design in 2019 and detail design approval in 2020, uses patented technology to operate the cooling process at low pressure without using additional refrigerants.

Performance verification was conducted using the same equipment installed on LNGCs to demonstrate the operating conditions when installed.

X-Reli was launched to conserve LNG cargo volumes under various operating conditions and to minimise the release of boil-off gasses (BOGs).

Dong-Yeon Lee, SHI's Director of the Ship and Offshore Research Institute, said: "LNG carriers equipped with the X-Reli can fully reliquefy the BOGs generated even in anchoring mode, which

will drastically reduce greenhouse gas emissions and further provide a solution to meet the ESG management of client companies."

"Reliquefaction allows increased flexibility and the potential to maximise cargo delivery and has been an important technology in the evolution of the operations of LNG carriers, as the industry developed more efficient cargo fuel use and still seeks to meet emissions reduction objectives.

"The ability to operate this at low or medium pressure reduces barriers to adoption of the technology and ABS is proud to be able to facilitate this and confirm compliance with existing rules and safety regulations and standards," added Darren Leskoski, ABS Vice President, Northern Pacific Regional Business Development. ■

Planned German import terminals offer capacity

Tree Energy Solution's (TES) 'Open Season' to assess gas export capacity market interest at its Wilhelmshaven Green Energy Hub was recently concluded.

Bi-lateral discussions will now start with those expressing interest in the non-binding process, which are expected to be completed next month.

Wilhelmshaven's LNG terminal will be incorporated separately and branded as the Avanthly terminal.

It will offer capacity to import both green hydrogen and green gas in the long term, as well as the opportunity to support Germany's energy security of supply by receiving LNG imports before its switch to green gas.

The planned start-up is in late 2025.

TES offered a terminal capacity with base services of up to 20 bill cu m per annum; however, the company received expressions of interest from around 25 interested parties for more than twice this capacity, it claimed.

Further north, the Stade Hanseatic Energy Hub (HEH) consortium developing an import terminal has invited binding capacity bids on the River Elbe.

Bids from interested parties are open from 16th June to 29th July, 2022.

Developers, Fluxys, Dow, Partners Group (acting on behalf of its clients) and Buss Group claimed that this was the first LNG project in Germany to invite binding bids.

The zero emission terminal's total capacity will be 13.3 bill cu m of natural gas per year with a send-out capacity of 21.7 GWh/h, corresponding to about 15% of Germany's gas demand. For long-term marketing, 12 bill cu m will be available.

With the binding open season, HEH reached another key milestone after the submission of the approval documents for the terminal and port and now enters a new project phase, the developers said.

Now that the main technical and commercial course has been set, the future focus will be more on the terminal's operational development, including construction and preparations for operation. For this purpose, Fluxys will strengthen the HEH team with additional operational know-how, the company said.

HEH is initially designed for LNG and low-carbon energy sources, such as bio-LNG and synthetic methane. As global supply grows, it will later be available to import hydrogen-based energy sources, such as ammonia.

With the expansion of the existing industrial port, two jetties will enable the handling of up to Q-Max LNGCs, as well as bunker services in the future. ■



High LNGC generator methane slip study finds

LNGCs' generators create more methane slip than the main engines, which can reduce their slip by being operated at higher loads.

These were some of the main findings of a study aimed at quantifying greenhouse gas (GHG) emissions from LNGCs, which was released last week.

Led by Queen Mary University of London (QMUL), this study helped improve the understanding of GHG emission profiles of LNGCs to meet national and international climate targets and corporate climate strategies, the authors said.

Last year, a research team from QMUL and SLR Consultants took direct measurements on board the Cheniere-chartered LNGC 'GasLog Galveston' on a round trip from Cheniere's Corpus Christi liquefaction plant to a European discharge port.

The measurements covered all sources of methane and CO₂ emissions, including engine exhausts, venting and fugitive emissions. The study also identified the best methods to directly measure LNGC methane emission, for future studies, or to retrofit on board continuous emissions monitors.

Recommendations

The results and recommendations included:

- * CO₂ emissions were lower than

other studies assumed, while venting and fugitive emissions of methane were also extremely low.

- * Uncombusted methane emissions from engine exhaust were in line with manufacturers' test data, but higher than other studies, due to higher methane slip from the generators (non-propulsive).
- * Engine methane slip emissions can be reduced drastically (by as much as 50%) by operating them at higher loads. The study noted that this was the LNGCs second voyage. Multiple engines were used at lower loads for operational reasons, and that the vessels often utilise engines at higher loads.
- * Also recommended was the installation of methane emissions monitors on engine exhausts to monitor and report more accurate methane emissions estimates and to support methane mitigation operational practices.

Dr Paul Balcombe, the Principal Investigator and lecturer in Chemical Engineering and Renewable Energy at QMUL, said: "This study helps to fill a big data gap when it comes to methane emissions from

LNG shipping. It's vital that we understand what their emissions profile is at a time when LNG imports are likely to grow substantially to reduce Europe's reliance on Russian gas.

"This study is the first-of-a-kind to measure total methane emissions from engines on board LNG carriers, including venting and fugitive emissions, but we need to do much more to get a representative sample of the approximately 600-strong LNGC fleet.

"As well as these academic measurement studies, increased monitoring of emissions from engines, vents and fugitives would allow us to identify and implement effective reduction measures, as hotspots are found," he said.

Fiji George, Cheniere's Senior Director for Climate and Sustainability, added: "This study provides actionable recommendations to monitor and reduce LNG shipping emissions to further strengthen the climate benefits of LNG.

"Following the recommendations by the study, Cheniere is expanding our emissions monitoring on the majority of our chartered carriers to further put this science into action. We appreciate the

work done by CAMS, QMUL and GasLog to help deliver data-driven transparency that can guide mitigation strategies," he said.

Kostas Karathanos, Gaslog's COO, commented: "Gaslog is committed to support climate action and is investing in partnerships, research and development to achieve this. GHG and air emissions reduction is a priority for us, as reflected in our ESG focus areas; we therefore enthusiastically joined this initiative aiming to better understand and monitor methane emissions from LNG carriers.

"The industry needs similar studies to gather concrete data and establish confidence in the operational emissions. This is essential in determining impactful mitigating measures and pursue realistic reduction targets," he concluded.

The study was funded by Enagis and CAMS (Collaboratory to Advance Methane Science), a research co-operative on methane science led by some of the world's energy development heads and administered by GTI Energy, a research, development and training organisation. ■

NEWS NUDGE

Ships - Newbuildings and charters

As *LNG Shipping News* went to press, Samsung Heavy Industries (SHI) announced that it had won a Won3.9 trillion (\$3 billion) order to build 14 LNGCs.

SHI said it will build 12 x 174,000 cu m LNGCs for an unidentified Bermudan based company and two identical vessels for an African shipping interest.

The company claimed that this was the single largest shipbuilding contract that South Korean shipyards had won thus far. It was not clear whether this

order was connected to Qatar's plans to considerably boost its LNG production capacity and LNGC fleet.

The four LNGCs reported earlier contracted at DSME for Qatar operations were ordered by a consortium involving H-Line, Pan Ocean and SK Shipping.

The price was believed to be the equivalent of \$210 million each and they are due for delivery in 2025.

Also ordered earlier at Hyundai Heavy Industries for the Qatar project were two LNGCs contracted by Knutsen at around \$215 million per vessel.

Elsewhere, Hyundai Samho Heavy Industries (HSHI) secured a contract to build two LNGCs.

Parent KSOE said last week that the deal was worth about Won617.3 billion, or about \$240 million per vessel, which is thought to be the highest price paid for a newbuilding 174,000 cu m LNGC.

HSHI will deliver the LNGCs by March, 2026 to an unidentified shipowner based in Oceania, believed to be Capital Gas.

Maran Gas has also ordered another two LNGCs at Daewoo (DSME) for the equivalent of \$234 million per vessel.

They are to be delivered in

2025/2026 and will be fitted with ME-GA engines.

Awilco has confirmed that it has chartered out one of its two LNGCs, still to be nominated, for three years, option a further two.

Describing the charterer as a leading European LNG importer, Awilco said that the charter is expected to start in December this year, subject to the usual vetting and inspection procedures.

The deal is expected to engender an EBITDA of around \$26 million per year during the charter period, the company said. ■

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LR awards AiP for methane abatement initiative

Lloyd's Register (LR) has granted Approval in Principle (AiP) to Daphne Technology (DT) for its patented methane abatement technology SlipPure.

SlipPure will reduce emissions on LNG-fuelled engines, which can suffer from methane slip, a process that causes unburned methane to leak, resulting in greenhouse gas emissions and increased ground-level ozone.

Even though methane slip has been significantly reduced in the latest gas engines, it remains a major risk in operating LNG fuelled vessels, LR said.

DT's development will benefit LNGCs and LNG-fuelled ships, which face an imminent threat once methane is integrated into the GHG regulatory regime.

Awarding the AiP will enable the technology to proceed to pilot applications and onward develop-

ment to full commercialisation.

Panos Mitrou, LR's Global Gas Segment Director, said: "LR is proud to award Approval in Principle to Daphne Technology for their new SlipPure technology, a significant milestone in methane abatement technology development.

"Methane emissions constitute a key risk to the gas sector and its shipping supply chain. Mitigating this remains essential to climate alignment and longevity of many LNG carriers and LNG fuelled ships. Retrofits, of this technology in ships, in the future, would allow them to benefit from the full potential of GHG savings of LNG," he said.

Mario Michan CEO, Daphne Tech-



LR's Global Gas Segment Director, Panos Mitrou (left) with Daphne Technology's CEO, Dr Mario Michon (right)

nology, added: "This is an important milestone for Daphne Technology. The Approval in Principle from LR demonstrates that our technology meets international safety standards and regulations, bringing us a step closer to deploying and commercialising our SlipPure system.

"We believe our technology can help address the climate challenge in the maritime and other hard-to-de-carbonise industries," he said.

The AiP was granted on 8th June 2022 in a ceremony at LR's stand during the Posidonia exhibition in Athens, Greece. ■

'Exemplar' to be moored at Inkoo

Gasgrid Finland and Fortum have signed a Letter of Intent (LoI) to locate Finland's first FSRU at Inkoo.

Located on the Southern Coast of Finland, Inkoo is a deepwater port close to the pipelines distributing gas mainly to industrial end-users in the Baltic.

This development enables independence from Russian pipeline gas, Gasgrid explained.

Gasgrid Finland is to charter the FSRU 'Exemplar' from Excelerate Energy for 10 years and aims to have the terminal available by next winter.

The vessel's capacity was said to be sufficient for the needs of both Finland and Estonia. Russian gas supplies through the Imatra entry point were stopped in May.

"I would like to thank Fortum, Gasgrid and their partners for taking quick action. It is important for our economy that the floating LNG terminal ensures the gas supply of our industry. The next step is to stay on schedule and get the port ready," said Mika Lintilä, Finland's Minister for Economic Affairs.

"The vessel project is absolutely essential for the security of supply of natural gas in the Baltic region - and therefore extremely urgent. I'm pleased that the decision on the location of the terminal was made in such fast schedule. As the need for the terminal covers the entire Baltic Sea

region, Inkoo provides an excellent location for the vessel," added Olli Sipilä, Gasgrid Finland CEO.

"At Fortum, we are very pleased to support energy security, industry as well as our national economy during these challenging times. Our Inkoo port is located on the site of our decommissioned coal power plant and provides nearly ready-to-use infrastructure and an optimal location for the country's first floating LNG terminal.

"In the future, our plan is to further develop industrial activity on the site, so that it can contribute to the de-carbonisation of

society," said Fortum's CEO, Markus Rauramo.

The port is accessible by a deepwater channel, it has a ready-to-use pier, is in close proximity of the Balticconnector pipeline between Finland and Estonia - and is available at short notice.

Furthermore, Inkoo underwent the necessary environmental impact assessments in 2014/2015.

'Exemplar' has a capacity of about 151,000 cu m, corresponding to around 68,000 tonnes of LNG, when fully loaded. This means approximately 1,050 GWh of energy content. ■

Monthly Large LNGC Values*

Newbuildings (174,000 cu m)	\$225.78 mill
Five years old (174,000 cu m)	\$176.75 mill
Total Fleet (546 ships)	\$69.80 bill
Orderbook (228 ships)	\$53.09 bill

*Source: VesselsValue (22/06/22)

*The above is updated each month courtesy of VesselsValue

LNG rate assessments

Spot market (155,000-165,000 cu m)

Region	This week	Change*
East of Suez	\$60,000	-\$26,000
West of Suez	\$60,000	-\$36,000
12 mos T/C	\$135,000	+\$15,000

*Since last report (09/06/22)

Source: Fearnleys (22/06/22)

WORLD LNG CARRIER ORDERBOOK

Name	Owners	Yard	Ordered	Capacity	Propulsion	Delivery
Minerva Amorgos	Minerva Marine	Samsung	1/1/2019	174,000	XDF	Q4, 2022
Clean Cajun	Dynagas	Hyundai Heavy	5/22/2019	200,000	XDF	Q2, 2022
Clean Copano	Dynagas	Hyundai Heavy	5/22/2019	200,000	XDF	Q3, 2022
Orion Star	JP Morgan	Samsung	6/1/2019	174,000	XDF	Q2, 2022
Orion Sun	JP Morgan	Samsung	6/1/2019	174,000	XDF	Q2, 2022
Prism Diversity	SK Shipping	Hyundai Heavy	6/29/2019	180,000	XDF	Q3, 2022
Asterix I	Capital Gas	Hyundai Heavy	8/1/2019	174,000	XDF	Q1, 2023
Hudong-zhonghua H1829a	CSSC	Hudong-Zhonghua	8/1/2019	174,000	XDF	Q1, 2024
Hudong-zhonghua H1830a	CSSC	Hudong-Zhonghua	8/1/2019	174,000	XDF	Q2, 2024
Alexey Kosygin	Smart LNG	Zvezda SSK	9/1/2019	172,600	TFDE - Azipod	Q1, 2023
Pyotr Stolypin	Smart LNG	Zvezda SSK	9/1/2019	172,600	TFDE - Azipod	Q3, 2023
Sergei Witte	Smart LNG	Zvezda SSK	9/1/2019	172,600	TFDE - Azipod	Q4, 2023
Zvezda 044	Smart LNG	Zvezda SSK	9/1/2019	172,600	TFDE - Azipod	Q4, 2023
Zvezda 045	Smart LNG	Zvezda SSK	9/1/2019	172,600	TFDE - Azipod	Q4, 2023
Bw Cassia	BWGas	DSME	10/1/2019	174,000	MEGI	Q3, 2022
Bw Iris	BWGas	DSME	10/1/2019	174,000	MEGI	Q3, 2022
Samsung 2364	MISC	Samsung	10/10/2019	174,000	XDF	Q1, 2023
Samsung 2365	MISC	Samsung	10/10/2019	174,000	XDF	Q1, 2023
Vivit Arabia Lng	H-Line	Hyundai Samho	12/1/2019	174,000	XDF	Q2, 2022
Alicante Knutsen	Knutsen	Hyundai Samho	12/18/2019	174,000	XDF	Q4, 2022
Huelva Knutsen	Knutsen	Hyundai Samho	12/18/2019	174,000	XDF	Q4, 2022
Malaga Knutsen	Knutsen	Hyundai Samho	12/18/2019	174,000	XDF	Q3, 2022
Santander Knutsen	Knutsen	Hyundai Samho	12/18/2019	174,000	XDF	Q2, 2022
Sm Albatross	Korea Line	Hyundai Heavy	12/18/2019	174,000	XDF	Q3, 2022
Sm Bluebird	Korea Line	Hyundai Heavy	12/18/2019	174,000	XDF	Q4, 2022
Lng Prosperity	JP Morgan	Hyundai Heavy	12/19/2019	174,000	XDF	Q4, 2022
Orion Song	JP Morgan	Hyundai Heavy	12/19/2019	174,000	XDF	Q4, 2022
Grace Freesia	NYK	Hyundai Samho	12/27/2019	173,000	XDF	Q2, 2022
Lagenda Serenity	K-Line	Hudong-Zhonghua	1/1/2020	79,960	XDF	Q2, 2022
Lagenda Suria	K-Line	Hudong-Zhonghua	1/1/2020	79,960	XDF	Q2, 2022
Hudong-zhonghua H1831a	ULT	Hudong-Zhonghua	6/30/2020	174,000	XDF	Q3, 2022
Hudong-zhonghua H1832a	ULT	Hudong-Zhonghua	6/30/2020	174,000	XDF	Q1, 2023
Hudong-zhonghua H1833a	ULT	Hudong-Zhonghua	6/30/2020	174,000	XDF	Q2, 2023
Lng Harmony	JP Morgan	Hyundai Heavy	7/20/2020	174,000	XDF	Q3, 2023
Orion Sage	JP Morgan	Hyundai Heavy	7/20/2020	174,000	XDF	Q3, 2023
El Ferrol Knutsen	Knutsen	Hyundai Samho	7/30/2020	174,000	XDF	Q4, 2022
Extremadura Knutsen	Knutsen	Hyundai Samho	7/30/2020	174,000	XDF	Q1, 2023
Daewoo 2514	Sovcomflot	DSME	8/1/2020	172,500	TFDE - Azipod	Q1, 2023
Daewoo 2515	Sovcomflot	DSME	8/1/2020	172,500	TFDE - Azipod	Q2, 2023
Daewoo 2516	Sovcomflot	DSME	8/1/2020	172,500	TFDE - Azipod	Q3, 2023
Daewoo 2517	MOL, COSCO	DSME	8/1/2020	172,500	TFDE - Azipod	Q3, 2023
Daewoo 2518	MOL, COSCO	DSME	8/1/2020	172,500	TFDE - Azipod	Q4, 2023
Daewoo 2519	MOL, COSCO	DSME	8/1/2020	172,500	TFDE - Azipod	Q4, 2023
Zvezda 046	Smart LNG	Zvezda SSK	8/1/2020	172,600	TFDE - Azipod	Q3, 2024
Zvezda 047	Smart LNG	Zvezda SSK	8/1/2020	172,600	TFDE - Azipod	Q3, 2024
Zvezda 048	Smart LNG	Zvezda SSK	8/1/2020	172,600	TFDE - Azipod	Q4, 2024
Zvezda 049	Smart LNG	Zvezda SSK	8/1/2020	172,600	TFDE - Azipod	Q4, 2024
Zvezda 050	Smart LNG	Zvezda SSK	8/1/2020	172,600	TFDE - Azipod	Q4, 2024

Name	Owners	Yard	Ordered	Capacity	Propulsion	Delivery
Zvezda 051	Smart LNG	Zvezda SSK	8/1/2020	172,600	TFDE - Azipod	Q3, 2025
Zvezda 052	Smart LNG	Zvezda SSK	8/1/2020	172,600	TFDE - Azipod	Q3, 2025
Zvezda 053	Smart LNG	Zvezda SSK	8/1/2020	172,600	TFDE - Azipod	Q4, 2025
Zvezda 054	Smart LNG	Zvezda SSK	8/1/2020	172,600	TFDE - Azipod	Q4, 2025
Zvezda 055	Smart LNG	Zvezda SSK	8/1/2020	172,600	TFDE - Azipod	Q4, 2025
Sm Golden Eagle	Korea Line	Hyundai Heavy	8/12/2020	174,000	XDF	Q3, 2023
Sm Kestrel	Korea Line	Hyundai Heavy	8/12/2020	174,000	XDF	Q4, 2023
Grazyna Gesicka	Knutsen	Hyundai Heavy	10/30/2020	174,000	XDF	Q2, 2023
Lech Kaczynski	Knutsen	Hyundai Heavy	10/30/2020	174,000	XDF	Q1, 2023
Samsung 2425	Maran Gas Maritime	Samsung	11/1/2020	174,000	XDF	Q3, 2023
Hyundai Samho 8100	Knutsen	Hyundai Samho	12/14/2020	174,000	XDF	Q3, 2024
Orion Sky	JP Morgan	Hyundai Heavy	12/14/2020	174,000	XDF	Q4, 2024
Hyundai Ulsan 3221	Pan Ocean	Hyundai Heavy	12/15/2020	174,000	XDF	Q3, 2024
Hyundai Ulsan 3222	Pan Ocean	Hyundai Heavy	12/15/2020	174,000	XDF	Q4, 2024
Samsung 2426	Pan Ocean	Samsung	1/1/2021	174,000	XDF	Q2, 2023
Jules Verne	Sovcomflot	Hyundai Samho	1/8/2021	174,000	XDF	Q2, 2023
Hudong-zhonghua H1837a	Shenzhen Gas	Hudong-Zhonghua	3/21/2021	79,960	XDF	Q1, 2023
Hyundai Ulsan 3294	Hyundai LNG Shipping	Hyundai Heavy	4/15/2021	174,000	XDF	Q1, 2024
Hyundai Ulsan 3295	Hyundai LNG Shipping	Hyundai Heavy	4/29/2021	174,000	XDF	Q2, 2024
Hyundai Ulsan 3296	Hyundai LNG Shipping	Hyundai Heavy	4/29/2021	174,000	XDF	Q3, 2024
Hyundai Samho 8139	Knutsen	Hyundai Samho	4/30/2021	174,000	XDF	Q4, 2023
Jiangnan H2637	Jovo Energy	Jiangnan	5/1/2021	79,800	XDF	Q4, 2023
Samsung 2473	Maran Gas Maritime	Samsung	5/1/2021	174,000	XDF	Q3, 2024
Samsung 2474	Maran Gas Maritime	Samsung	5/1/2021	174,000	XDF	Q3, 2024
Daewoo 2521	Hyundai LNG Shipping	DSME	5/28/2021	174,000	MEGI	Q3, 2023
Hyundai Ulsan 3290	Dynagas	Hyundai Heavy	5/31/2021	200,000	ME-GA	Q4, 2023
Hyundai Ulsan 3291	Dynagas	Hyundai Heavy	5/31/2021	200,000	ME-GA	Q4, 2023
Hyundai Ulsan 3292	Dynagas	Hyundai Heavy	5/31/2021	200,000	ME-GA	Q1, 2024
Hyundai Ulsan 3293	Dynagas	Hyundai Heavy	5/31/2021	200,000	ME-GA	Q3, 2023
Daewoo 2520	MOL	DSME	6/1/2021	174,000	MEGI	Q4, 2023
Amore Mio I	Capital Gas	Hyundai Heavy	6/18/2021	174,000	ME-GA	Q4, 2023
Axios II	Capital Gas	Hyundai Heavy	6/18/2021	174,000	ME-GA	Q4, 2023
Alexandre Dumas	Sovcomflot	Hyundai Samho	7/1/2021	170,520	XDF	Q1, 2024
Hyundai Samho 8147	H-Line	Hyundai Samho	7/1/2021	174,000	XDF	Q3, 2023
Samsung 2459	Celsius Shipping	Samsung	7/1/2021	180,000	ME-GA	Q2, 2023
Samsung 2460	Celsius Shipping	Samsung	7/1/2021	180,000	ME-GA	Q3, 2023
Samsung 2461	Celsius Shipping	Samsung	7/1/2021	180,000	ME-GA	Q4, 2023
Victor Hugo	Sovcomflot	Hyundai Samho	7/1/2021	170,520	XDF	Q3, 2024
Hyundai Samho 8101	Knutsen	Hyundai Samho	7/13/2021	174,000	XDF	Q4, 2023
Hyundai Samho 8102	Knutsen	Hyundai Samho	7/13/2021	174,000	ME-GA	Q3, 2025
Hyundai Ulsan 3320	JP Morgan	Hyundai Heavy	7/13/2021	174,000	ME-GA	Q3, 2025
Hyundai Ulsan 3321	JP Morgan	Hyundai Heavy	7/13/2021	174,000	ME-GA	Q3, 2025
Hyundai Ulsan 3224	Pan Ocean	Hyundai Heavy	7/14/2021	174,000	ME-GA	Q4, 2024
Hyundai Ulsan 3225	Pan Ocean	Hyundai Heavy	7/14/2021	174,000	ME-GA	Q4, 2024
Daewoo 2522	Hyundai LNG Shipping	DSME	7/15/2021	174,000	MEGI	Q2, 2024
Hyundai Samho 8148	Knutsen	Hyundai Samho	7/22/2021	174,000	XDF	Q1, 2024
Hyundai Samho 8149	Knutsen	Hyundai Samho	7/22/2021	174,000	ME-GA	Q1, 2024
Hyundai Ulsan 3297	Hyundai LNG Shipping	Hyundai Heavy	7/22/2021	174,000	XDF	Q2, 2024
Hyundai Ulsan 3298	Hyundai LNG Shipping	Hyundai Heavy	7/22/2021	174,000	XDF	Q4, 2024
Hyundai Ulsan 3299	Hyundai LNG Shipping	Hyundai Heavy	7/22/2021	174,000	XDF	Q1, 2025

Name	Owners	Yard	Ordered	Capacity	Propulsion	Delivery
Samsung 2579	Celsius Shipping	Samsung	7/26/2021	180,000	ME-GA	Q1, 2024
Samsung 2584	Celsius Shipping	Samsung	8/1/2021	180,000	ME-GA	Q3, 2024
Samsung 2585	Celsius Shipping	Samsung	8/1/2021	180,000	ME-GA	Q3, 2024
Hudong-zhonghua H1838a	K-Line	Hudong-Zhonghua	9/1/2021	79,960	XDF	Q3, 2023
Hyundai Samho 8140	Capital Gas	Hyundai Samho	9/1/2021	174,000	ME-GA	Q3, 2024
Daewoo 2523	MOL	DSME	9/14/2021	174,000	ME-GA	Q1, 2024
Daewoo 2524	MOL	DSME	9/14/2021	174,000	ME-GA	Q2, 2024
Daewoo 2525	MOL	DSME	9/14/2021	174,000	ME-GA	Q3, 2024
Daewoo 2526	MOL	DSME	9/14/2021	174,000	ME-GA	Q4, 2024
Daewoo 2527	MOL	DSME	10/1/2021	174,000	ME-GA	Q3, 2024
Hudong-Zhonghua QP #1	Qatar Petroleum	Hudong-Zhonghua	10/1/2021	175,000	XDF	Q3, 2024
Hudong-Zhonghua QP #2	Qatar Petroleum	Hudong-Zhonghua	10/1/2021	175,000	XDF	Q1, 2024
Hudong-Zhonghua QP #3	Qatar Petroleum	Hudong-Zhonghua	10/1/2021	175,000	XDF	Q4, 2024
Hudong-Zhonghua QP #4	Qatar Petroleum	Hudong-Zhonghua	10/1/2021	175,000	XDF	Q1, 2025
MOL 23	MOL	DSME	10/1/2021	174,000	ME-GA	Q3, 2023
MOL 25	MOL	DSME	10/1/2021	174,000	ME-GA	Q3, 2025
MOL 26	MOL	DSME	10/1/2021	174,000	ME-GA	Q3, 2026
Samsung 2580	NYK	Samsung	10/1/2021	174,000	XDF	Q3, 2023
Samsung 2581	NYK	Samsung	10/1/2021	174,000	XDF	Q4, 2023
Samsung 2582	NYK	Samsung	10/1/2021	174,000	XDF	Q4, 2023
Samsung 2583	NYK	Samsung	10/1/2021	174,000	XDF	Q1, 2024
Samsung 2592	JP Morgan	Samsung	10/1/2021	174,000		Q2, 2024
Samsung 2593	JP Morgan	Samsung	10/1/2021	174,000		Q3, 2024
Samsung 2594	JP Morgan	Samsung	10/1/2021	174,000		Q4, 2024
Samsung 2595	JP Morgan	Samsung	10/1/2021	174,000		Q1, 2025
Hyundai Ulsan 3341	Capital Gas	Hyundai Heavy	11/4/2021	174,000	ME-GA	Q2, 2024
Hyundai Ulsan 3342	Capital Gas	Hyundai Heavy	11/4/2021	174,000	ME-GA	Q2, 2024
Qatar DSME 1/4	Qatar Petroleum	DSME	11/7/2021	174,000	MEGI	Q1, 2025
Qatar DSME 2/4	Qatar Petroleum	DSME	11/7/2021	174,000	MEGI	Q3, 2025
Qatar DSME 3/4	Qatar Petroleum	DSME	11/7/2021	174,000	MEGI	Q2, 2025
Qatar DSME 4/4	Qatar Petroleum	DSME	11/7/2021	174,000	MEGI	Q4, 2025
Qatar SHI 1/2	Qatar Petroleum	Samsung	11/7/2021	174,000	ME-GA	Q1, 2025
Qatar SHI 2/2	Qatar Petroleum	Samsung	11/7/2021	174,000	ME-GA	Q1, 2025
Daewoo 2528	Maran Gas Maritime	DSME	11/10/2021	174,000	MEGI	Q3, 2024
Daewoo 2529	Maran Gas Maritime	DSME	11/10/2021	174,000	MEGI	Q4, 2024
Daewoo 2530	BWGas	DSME	11/25/2021	174,000	MEGI	Q1, 2025
Daewoo 2531	BWGas	DSME	11/25/2021	174,000	MEGI	Q2, 2025
Qatar HHI 1	Qatar Petroleum	Hyundai Heavy	11/29/2021	174,000		Q1, 2025
Qatar HHI 2	Qatar Petroleum	Hyundai Heavy	11/29/2021	174,000		Q1, 2025
Qatar HHI 3	Qatar Petroleum	Hyundai Heavy	11/29/2021	174,000		Q2, 2025
Qatar HHI 4	Qatar Petroleum	Hyundai Heavy	11/29/2021	174,000		Q3, 2025
Samsung 2600	JP Morgan	Samsung	12/1/2021	174,000		Q3, 2024
Samsung 2601	JP Morgan	Samsung	12/1/2021	174,000		Q1, 2025
Samsung 2598	Celsius Shipping	Samsung	12/7/2021	180,000	ME-GA	Q1, 2025
Samsung 2599	Celsius Shipping	Samsung	12/7/2021	180,000	ME-GA	Q2, 2025
Hudong-zhonghua H1834a	ULT	Hudong-Zhonghua	12/8/2021	174,000	XDF	Q3, 2024
Hudong-zhonghua H1835a	ULT	Hudong-Zhonghua	12/8/2021	174,000	XDF	Q4, 2024
Hudong-zhonghua H1836a	ULT	Hudong-Zhonghua	12/8/2021	174,000	XDF	Q1, 2025
Samsung 2604	NYK	Samsung	12/27/2021	174,000	XDF	Q4, 2024
Daewoo 2532	GasLog	DSME	1/1/2022	174,000	MEGI	Q2, 2024

DFDE = dual fuel diesel engines, STRH = steam turbine reheat / ultra steam turbine, MEGI = marine electric gas injection, DRL = slow speed diesel, FSRU = vessel with regas capacity, FLNG = floating LNG production unit
Data last updated = Data last updated = 12th April 2022

Name	Owners	Yard	Ordered	Capacity	Propulsion	Delivery
Daewoo 2533	GasLog	DSME	1/1/2022	174,000	MEGI	Q3, 2024
Daewoo 2534	GasLog	DSME	1/1/2022	174,000	MEGI	Q2, 2025
Daewoo 2535	GasLog	DSME	1/1/2022	174,000	MEGI	Q3, 2025
NYK 2	NYK	Hyundai Samho	1/1/2022	174,000	XDF	Q1, 2025
Qatar SHI 3	Qatar Petroleum	Samsung	1/1/2022	174,000	ME-GA	Q1, 2025
Qatar SHI 4	Qatar Petroleum	Samsung	1/1/2022	174,000	ME-GA	Q2, 2025
Hyundai Samho 8173	SK Shipping	Hyundai Samho	1/4/2022	174,000	ME-GA	Q3, 2024
Daewoo 2537	Maran Gas Maritime	DSME	1/6/2022	174,000	MEGI	Q3, 2025
Daewoo 2538	Maran Gas Maritime	DSME	1/6/2022	174,000	MEGI	Q4, 2025
Hudong-zhonghua H1880a	MOL	Hudong-Zhonghua	1/7/2022	174,000	XDF	Q4, 2024
Hudong-zhonghua H1881a	MOL	Hudong-Zhonghua	1/7/2022	174,000	XDF	Q3, 2025
Hudong-zhonghua H1882a	MOL	Hudong-Zhonghua	1/7/2022	174,000	XDF	Q4, 2025
Hudong-zhonghua H1883a	MOL	Hudong-Zhonghua	1/7/2022	174,000	XDF	Q1, 2026
Hudong-zhonghua H1884a	MOL	Hudong-Zhonghua	1/7/2022	174,000	XDF	Q2, 2026
Hudong-zhonghua H1885a	MOL	Hudong-Zhonghua	1/7/2022	174,000	XDF	Q3, 2026
Samho Jan		Hyundai Samho	1/10/2022	174,000	ME-GA	Q1, 2025
Daewoo	MOL	DSME	1/17/2022	174,000	ME-GA	Q4, 2024
Daewoo 2539	Maran Gas Maritime	DSME	2/7/2022	174,000	MEGI	Q4, 2025
Daewoo 2540	Maran Gas Maritime	DSME	2/7/2022	174,000	MEGI	Q4, 2025
Bono Samho 1	Bono Energy	Hyundai Samho	2/10/2022	174,000	ME-GA	Q1, 2025
Bono Samho 2	Bono Energy	Hyundai Samho	2/10/2022	174,000	ME-GA	Q1, 2025
Qatar DSME 5	Qatar Petroleum	DSME	2/15/2022	174,000	MEGI	Q2, 2025
Qatar HHI 5	Qatar Petroleum	Hyundai Heavy	2/15/2022	174,000		Q3, 2025
Qatar HHI 6	Qatar Petroleum	Hyundai Heavy	2/15/2022	174,000		Q4, 2025
Qatar SHI 5	Qatar Petroleum	Samsung	2/15/2022	174,000	ME-GA	Q2, 2025
HL 1	H-Line	Samsung	2/16/2022	174,000		Q1, 2025
HL 2	H-Line	Samsung	2/16/2022	174,000		Q2, 2025
HL 3	H-Line	Samsung	2/16/2022	174,000		Q3, 2025
HL 4	H-Line	Samsung	2/16/2022	174,000		Q3, 2025
Glovis Samho	Hyundai Glovis	Hyundai Samho	2/21/2022	174,000		Q4, 2024
Samsung 1		Samsung	2/24/2022	174,000		Q2, 2025
Samsung 2		Samsung	2/24/2022	174,000		Q2, 2025
Samsung 3		Samsung	2/24/2022	174,000		Q3, 2025
Samsung 4		Samsung	2/24/2022	174,000		Q3, 2025
Jiangnan ADNOC 1	ADNOC	Jiangnan	3/1/2022	175,000	XDF	Q1, 2025
Jiangnan ADNOC 2	ADNOC	Jiangnan	3/1/2022	175,000	XDF	Q2, 2025
HHI 1	Dynagas	Hyundai Heavy	3/3/2022	200,000	ME-GA	Q1, 2025
HHI 2	Dynagas	Hyundai Heavy	3/3/2022	200,000	ME-GA	Q2, 2025
HHI 3	Dynagas	Hyundai Heavy	3/3/2022	200,000	ME-GA	Q4, 2025
BW DSME 3	BWGas	DSME	3/18/2022	174,000	MEGI	Q4, 2025
BW DSME 4	BWGas	DSME	3/18/2022	174,000	MEGI	Q4, 2025
VG DSME 1	Venture Global LNG	DSME	3/24/2022	200,000		Q3, 2025
VG DSME 2	Venture Global LNG	DSME	3/24/2022	200,000		Q4, 2025
VG DSME 3	Venture Global LNG	DSME	3/24/2022	200,000		Q4, 2025
Dalian Merchant 1	China Merchant	Dalian Shipbuilding	3/31/2022	175,000	XDF	Q3, 2025
Dalian Merchant 2	China Merchant	Dalian Shipbuilding	3/31/2022	175,000	XDF	Q2, 2026
Samho 1	Knutzen	Hyundai Samho	3/31/2022	174,000	ME-GA	Q1, 2026
Samho 2	Knutzen	Hyundai Samho	3/31/2022	174,000	ME-GA	Q2, 2025
Samsung Apr	Celsius Shipping	Samsung	3/31/2022	180,000	ME-GA	Q4, 2025

WORLD SMALL SCALE LNG FLEET*

Built	Name	CBM	Cargo Type	Trading area	Trading in LNG?	Ship Owner / Operator
1974	Seagas	187	LNG	Sweden	Yes	AGA
1988	Kayoh Maru	1,517	LNG	Japan	Yes	Daiichi
1993	Aman Bintulu	18,928	LNG	Malaysia - Japan	Yes	Perbadanan/NYK
1996	Surya Aki	19,475	LNG	Indonesia - Japan	Yes	MCGC
1997	Aman Sendai	18,928	LNG	Malaysia - Japan	Yes	Perbadanan/NYK
1998	Pelita Energy	18,800	LNG	Malaysia - Japan	Yes	Perbadanan/NYK
2000	Triputra	23,096	LNG	Indonesia - Japan	Yes	MCGC
2003	Pioneer Knutsen	1,100	LNG	Norway	Yes	Knutsen
2003	Shinju Maru No.1	2,540	LNG	Japan	Yes	Shinwa
2005	North Pioneer	2,500	LNG	Japan	Yes	Japan Liquid Gas
2007	Sun Arrows	19,531	LNG	Malaysia - Russia - Japan	Yes	Mitsui
2008	Kakurei Maru	2,536	LNG	Japan	Yes	Hogaki Zosen
2008	Shinju Maru No.2	2,540	LNG	Japan	Yes	Shinwa
2009	Coral Methane	7,551	LNG/LPG/Ethylene	Northwest Europe/Baltics	Yes, sometimes	Anthony Veder
2010	Coral Favia	10,000	LNG/LPG/Ethylene	Worldwide	No	Anthony Veder
2010	Coral Fraseri	10,000	LNG/LPG/Ethylene	Worldwide	No	Anthony Veder
2011	Coral Furcata	10,000	LNG/LPG/Ethylene	Worldwide	No	Anthony Veder
2011	Coral Fungia	10,000	LNG/LPG/Ethylene	Worldwide	No	Anthony Veder
2011	Akebono Maru	3,556	LNG	Japan	Yes	Chuo Kaiun
2011	Vision Spirit	12,000	LNG/LPG/Ethylene	Worldwide	No	Teekay
2011	Unikum Spirit	12,000	LNG/LPG/Ethylene	Worldwide	No	Teekay
2012	Coral Energy	15,600	LNG	Northwest Europe/Baltics	Yes	Anthony Veder
2013	Coral Anthelia	6,500	LNG/Ethylene			Anthony Veder
2013	JX Energy TBN	2,500	LNG	Japan	Yes	JX Energy
2013	Kakuyu Maru	2,500	LNG	Japan	Yes	Tsurumi Sunmarine
2015	JS Ineos Ingenuity	27,500	LNG/Ethylene	Markus Hook - Rafnes	Ethane, for Ineos	Evergas
2015	JS Ineos Insight	27,500	LNG/Ethylene	Markus Hook - Rafnes	Ethane, for Ineos	Evergas
2015	JS Ineos Intrepid	27,500	LNG/Ethylene	Markus Hook - Rafnes	Ethane, for Ineos	Evergas
2015	LNG Barge TBN	3,000	LNG	US Coast	Yes	LNG America
2015	PetroChina TBN	30,000	LNG	China		PetroChina
2016	Hai Yang Shi You 301	30,000	LNG	Bali FSU	Yes	CETS (CNOOC)
2016	Clean Jacksonville	2,200	LNG	US Coast	Yes	CME
2016	JS Ineos Indepence	27,500	LNG/Ethylene	Markus Hook - Rafnes	Ethane, for Ineos	Evergas
2016	JS Ineos Innvovation	27,500	LNG/Ethylene	Markus Hook - Rafnes	Ethane, for Ineos	Evergas
2016	JS Ineos Inspiration	27,500	LNG/Ethylene	Markus Hook - Rafnes	Ethane, for Ineos	Evergas
2016	LNG Prime	2,250	LNG	Northwest Europe	Yes	Veka Deen LNG
2017	Coralius	5,800	LNG	Northwest Europe/Baltics	Yes, for Skangas	Anthony Veder
2017	Coral EnergiCE	18,000	LNG	Northwest Europe/Baltics	Yes	Anthony Veder
2017	Coral Encanto	30,000	LNG	China	Yes	Anthony Veder
2017	JS Ineos Invention	27,500	LNG/Ethylene	Markus Hook - Rafnes	Ethane, for Ineos	Evergas
2017	JS Ineos Intuition	27,500	LNG/Ethylene	Markus Hook - Rafnes	Ethane, for Ineos	Evergas
2017	Oizmendi	600	LNG	Spain	Yes	Itsas Gas
2017	LNG-Gorskaya TBN	7,300	LNG	Russia	Yes	LNG-Gorskaya
2017	LNG-Gorskaya TBN	7,300	LNG	Russia	Yes	LNG-Gorskaya
2017	LNG-Gorskaya TBN	7,300	LNG	Russia	Yes	LNG-Gorskaya
2017	Green Zeebrugge	5,000	LNG	Northwest Europe	Yes	NYK
2017	New Frontier 1	6,500	LNG	Northwest Europe	Yes	Shell
2018	Kairos	7,500	LNG	Baltic	Yes	Bernhard Schulte
2018	LNG London	3,000	LNG	Northwest Europe	Yes	Shell

Built	Name	CBM	Cargo Type	Trading area	Trading in LNG?	Ship Owner / Operator
2018	Shell Bunker Barge TBN 2	6,500	LNG	Northwest Europe	Yes	Shell
2018	Shell Bunker Barge TBN 3	6,500	LNG	Northwest Europe	Yes	Shell
2018	Bunker Breeze	1,200	LNG	Barcelona	Yes	Suardiaz Energy Shipping
2018	HUA XIANG 8	13,720	LNG	China	Yes	Zhejiang Huaxiang
2019	SM Jeju LNG1	7,500	LNG	Korea	Yes	Korea Line
2019	Gas Agility	18,600	LNG	NWE	Yes	MOL
2019	Flexfueller 001	1,480	LNG	Amsterdam	Yes	Titan LNG
2020	Avenir Advantage	7,500	LNG	Mediterranean	Yes	Avenir LNG
2020	Avenir Accolade	7,500	LNG	Mediterranean	Yes	Avenir LNG
2020	Avenir Aspiration	7,500	LNG		Yes	Avenir LNG
2020	Kaguya	3,500	LNG	Japan	Yes	CLS
2020	CNTIC VPOWER Global	28,000	LNG	Myanmar	Yes	Dalian Inteh Group
2020	Ecobunker Tokyo Bay	2,500	LMG	Japan	Yes	Ecobunkers
2020	Optimus	6,000	LNG	NWE	Yes	Elenger
2020	FueLNG Bellina	7,500	LNG	Singapore	Yes	FueLNG
2020	SM Jeju LNG2	7,500	LNG	Korea	Yes	Korea Line
2020	Q-LNG 4000	4,000	LNG	US Coast	Yes	Q-LNG Transport/Harvey Gulf
2020	Flexfueller 002	1,480	LNG	Antwerp	Yes	Titan LNG
2021	Xin Ao Pu Tuo Hao	8,500	LNG	China	Yes	ENN
2021	Avenir Ascension	7,500	LNG		Yes	Avenir LNG
2021	Hai Gang Wei Lai	20,000	LNG	China	Yes	SSES
2021	Bergen LNG	850	LNG	Norway	Yes	Bergen Tankers
2021	Dmitry Mendeleev	5,800	LNG	Russia	Yes	Gazprom Neft
2021	JMU TBN	2,500	LNG	Japan	Yes	JMU
2021	Ravenna Knutsen	30,000	LNG	Mediterranean	Yes	Knutsen OAS
2021	Brassavola	12,000	LNG	Singapore	Yes	MOL
2021	Gas Vitality	18,600	LNG	Mediterranean	Yes	MOL
2021	TG TBN	500	LNG	Korea	Yes	Trans Gas
2021	Titan Hyperion	8,000	LNG	Benelux	Yes	Titan LNG
2022	Coral Nordic	30,000	LNG	Worldwide	Yes	Anthony Veder
2022	Avenir Achievement	20,000	LNG	Worldwide	Yes	Avenir LNG
2022	Haugesund Knutsen	5,000	LNG	Spain	Yes	Knutsen OAS
2022	Clean Cañaveral	5,400	LNG	USG	Yes	PNE
2022	K.Lotus	18,000	LNG	Korea	Yes	K Line
2023	Cryopeak TBA	4,000	LNG	West Canada	Yes	Cryopeak
2023	Knutsen TBN	12,500	LNG	Spain	Yes	Knutsen OAS
2023	SM Jeju LNG3	7,500	LNG	Korea	Yes	Korea Line
2023	Pan Ocean TBN	18,000	LNG	USG	Yes	Pan Ocean Co
2023	Krios	4,200	LNG	Benelux	Yes	Titan LNG
2023	Fratelli Cosulich TBN	8,000	LNG	Mediterranean	Yes	Fratelli Cosulich
2023	Kanfer TBN	6,000	LNG	Worldwide	Yes	Kanfer Shipping
2023	Kanfer TBN	6,000	LNG	Worldwide	Yes	Kanfer Shipping
2023	PNE TBN	5,500	LNG	USG	Yes	PNE
2024	Avenir TBN (option)	20,000	LNG	Worldwide	Yes	Avenir LNG
2024	Avenir TBN (option)	20,000	LNG	Worldwide	Yes	Avenir LNG
2024	TBN	30,000	LNG	Australia	Yes	Anthony Veder ?
2024	Crowley TBN	12,000	LNG	US Coast	Yes	Crowley Maritime
2024	CNOOC TBN	12,000	LNG	China	Yes	CNOOC
2024	TBN	12,500	LNG	Worldwide	Yes	???
2024	Keys TBN	3,500	LNG	Japan	Yes	Keys Bunkering West Japan Co
2026	Avenir TBN (option)	20,000	LNG	Worldwide	Yes	Avenir LNG
2026	Avenir TBN (option)	20,000	LNG	Worldwide	Yes	Avenir LNG