LNG journal
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48 pages essential LNG news!
May 2018

## In this issue:

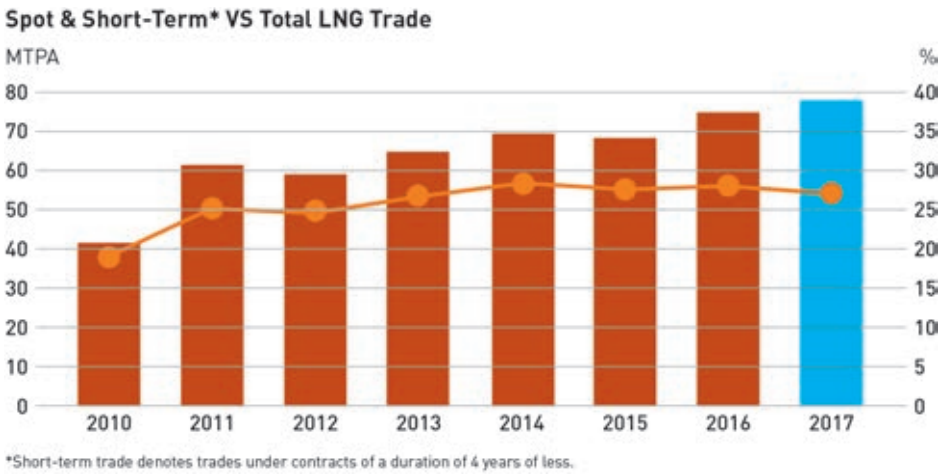


# International Group of LNG Importers reports on shipping and market trends

*France-based body says LNG trade recorded highest supply growth since 2010 and market changes*

The France-based International Group of Liquefied Natural Gas Importers (GIIGNL) said in its annual report that global LNG trade recorded its highest growth in supply since 2010 and also noted other market changes.

As new production came on stream in Australia, Russia and Malaysia and the global fleet of carriers continued to expand, imports in 2017 recorded their highest annual growth rate in seven years, up 9.9 percent to reach 289.8 million tonnes.




**Spot and short-term volumes just over a quarter of total**

## Start-ups

"Despite several delayed start-ups, new liquefaction capacity continued to come online in various areas of the world ranging from the United States to Australia and Russia, leading to a 26.2 MTPA increase in LNG supply compared with 2016," said GIIGNL President Jean-Marie Dauger in his introduction.

"Meanwhile, expectations of an LNG surplus and of depressed prices have not materialized, as rising imports into China contributed substantially to balancing the market," added Dauger.

Founded in 1971, at the outset of the LNG industry, the GIIGNL's membership has grown to 78 companies worldwide, comprising nearly all those active in LNG imports or in the operation of LNG terminals.

It is a non-profit organization and its resources only come from the membership fees.

The association constitutes a forum for exchange of experience among its members, with a view to enhancing safety, reliability and efficiency of LNG imports.

## Spot market

"Mirroring the 2016 situation, spot LNG prices followed a seasonal profile last year, although the increase in the last few weeks of 2017 was stronger than a year earlier because of much higher than expected Chinese demand and colder than normal weather in North East Asia," explained the GIIGNL President.

"Contract LNG prices also increased as a consequence of higher oil prices," he added.

"Spot charter rates finished the year on a bullish note, mainly driven by the demand for ships to transport US LNG," stated Dauger.

The total LNG tanker fleet consisted of 511 vessels at the end of 2017. It included 28 floating storage and regasification units and 38 vessels of less than 50,000 cubic metres capacity.

## Capacity

"Total shipping capacity at the end of 2017 stood at 73.9 million cubic metres. Total operational capacity (vessels that are known to be in service) amounted to 69.9 million cubic metres," said the report.

"In 2017, the average spot charter rate for a 160,000 cubic metres-capacity LNG carrier stood at $46,058/day compared to an average $33,528/day in 2016," it added.

The surge in LNG supply was driven by new production from Australia (up 10.7MT) and from the US (up 9.6MT) as well as by the better performance of existing liquefaction plants in Algeria, Angola and Nigeria (up 6.2MT).

"In the opposite direction, supplies from the Middle East decreased by 2.3 MT as a result of scheduled and unscheduled maintenance in Qatar," said the GIIGNL's report.

The Pacific Basin remains the largest source of LNG supplies with 131.4MT, or 45.3 percent of the global market, followed by the Middle East (31.5 percent) and the Atlantic Basin (23.2 percent).

The nations of southern Europe are increasing their reliance on LNG imports during periods of peak demand and are ready importers of new US volumes, while the countries of northern Europe led by the UK are losing their appetite, along with the Dutch and the Belgians.

There were eight substantial LNG importing nations in regard to their net volumes and six other importers of less than 1 million tonnes, according to the GIIGNL data.

Europe imported a net 45.68MT, with the eight leading nations unloading 42.89MT of cargoes compared with 36.39MT the previous year, a drop of just over 14 percent.

## UK tumble

The UK showed the biggest fall with 4.88MT in 2017, dropping by 2.60MT, or 35 percent, from the 7.48MT of cargoes unloaded in 2016.

The 2017 leader among the eight countries that imported more than one

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million was Spain with a net total of 12.10MT versus a net 10.17MT in 2016.

Spain was followed by France in second place with 7.35MT (5.55MT in 2016), Turkey 7.33MT. (5.47MT), Italy 5.97MT. (4.59MT), the UK 4.88MT (7.48MT), Portugal 2.71MT (1.31MT), Greece 1.28MT (0.53MT) and Poland 1.27MT (0.82MT).

There were six other European nations that imported less than a net 1MT, including Belgium 0.88MT, Lithuania 0.85MT, the Netherlands 0.57MT, Sweden 0.32MT, Malta 0.23MT and Finland 0.05MT.

Although the Netherlands dropped down the order of importers, it was still Europe's second-largest re-exporter after France, but for total volumes of just 500,000 tonnes.

The GIIGNL said that in Europe, net LNG imports were up by 7.5MT, or 19.5 percent, mainly driven by gas-fired power demand

## Med region

However, there was a surge of imports in Southern Europe because of a combination of low hydropower, low nuclear production in France and hot weather.

This led to an additional 9.1 million tonnes of imports for France, Greece, Italy, Portugal, Spain and Turkey, whereas net imports into northern countries such as Belgium, Netherlands and the UK dropped.

"The decline is mainly attributable to the UK which experienced a sharp drop (by 2.6MT) in LNG intake due to the reduction of deliveries from Qatar.

"Despite the increase in imports in 2017, Europe's share of global LNG imports has fallen by nearly 50 percent since 2010, mainly due to a decline in gas demand and to the competition from pipeline imports," said the report.

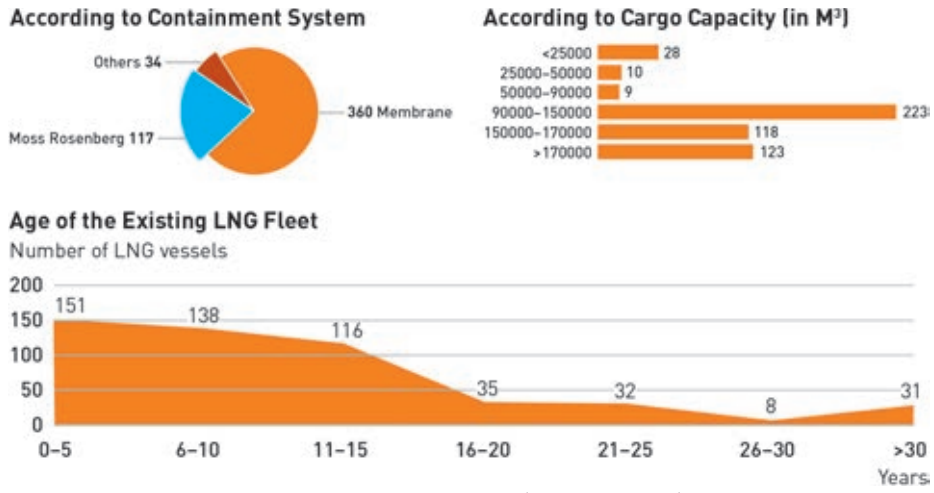
Europe remained slightly active as an LNG re-exporter in 2017.

From total global LNG import volumes of 289.8MT only 2.6MT of cargoes were re-exported from 12 countries to 20 destination countries, down from 4.5MT in 2016.

## Differentials

"This was because of narrower price differentials between markets for much of the year and due to the increased availability of destination-flexible LNG," said the report.

France was the main source of LNG re-exports at 0.7 MT, followed by the Netherlands (0.5MT) and the Asian city-state of Singapore (0.5 MT).




**LNG global fleet capacity, storage and age (GIIGNL data)**

"More than one quarter of the reloaded volumes (0.7 MT) were delivered to China and two new countries started re-exporting LNG last year, Japan and the Dominican Republic," it added.

Asian LNG imports grew by 10.2 percent to 211.2MT as the region consolidated its position as the largest LNG importing area with a 72.9 percent market share.

"Japan remained the leading importing country, with 83.5MT, or a 28.8 percent market share, followed by China (39MT). The latter country overtook South Korea as the world's second-largest LNG importer and contributed substantially to balancing demand with supply in the LNG market in 2017," stated the GIIGNL report.

"As a result of a political decision to favour the use of gas over coal to reduce air pollution in major cities, China's imports recorded a 42.3 percent (up 1.6MT) increase," it added.

## Demand

On the demand side, the LNG market is becoming more diverse and more complex, with a total of 40 countries now importing LNG.

"Despite competitive LNG prices and notwithstanding the development of FSRUs, only one country, Malta, started receiving LNG last year, a sign that practical commercial and regulatory challenges still need to be overcome in order for new importers to develop LNG import infrastructure," explained the report.

Most of the demand growth occurred in Asia, where LNG imports grew by 19.6 MT. Mainly influenced by energy policy orientation in China, Korea and Taiwan, demand from North East Asian buyers experienced a strong rebound, which was not a given at the beginning of the year.

"Our industry seems to experience an acceleration of change and 2017 was indeed a year for pioneers: first FLNG plant online, first LNG bunkering vessels operating in Europe and first LNG exported from the Arctic region," the report pointed out.

"As meaningful, the first large order of nine LNG-fueled containerships indicated that new market sectors are ready to embrace LNG and pave the way for the worldwide implementation of LNG as a fuel solution to reduce marine pollution," it said.

"Driven by US LNG exports, the significant supply build-up on the horizon could further transform our industry and bring on new evolutions, including a rise in market liquidity and flexibility," according to the GIIGNL.

## Commercial

"New commercial instruments were implemented to adapt to the new realities of the markets as some traditional ones, such as destination restrictions, are being progressively shelved. As aggregators and traders take a greater share of the market, the break-up of the traditional value chain is gathering pace," it said.

"However, given the recent slow-down in FIDs in the last two years and the significant demand growth prospects, risks of a potential tightening of demand and supply must not be minimized for the medium term," added the report.

"Cost reduction - without compromising safety and reliability - and meeting the changing requirements of buyers and consumers will be key for new projects to be developed," it stated.

"Over the last 46 years, the GIIGNL has been working to disseminate technical and commercial best practices and to develop safer LNG imports all over the world.

"Through our annual report and other publications, our Association remains committed to provide key insights into the market and to support the development of a more efficient, more diverse and more sustainable LNG industry," it concluded. ■

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# LNG price levels and market will weather volume increases because of steady demand worldwide

*Future average cargo costs are dependent on Asian demand outcomes and US feed-gas and shipping costs*

Prices for LNG delivered from Australia into North Asia have increased, driven by a gradual recovery in oil prices. Oil-linked pricing has been the dominant pricing mechanism in Asia since Japan began importing LNG in the late1960s as a substitute for oil in power generation.

The average price of LNG (Delivered Ex Ship) imported by Japan, the world's largest LNG buyer, during 2017 was US$8.00 per million British thermal units, up from US$6.80 per MMBtu from the previous year.

## Asian shipments

LNG spot DES cargoes from Asian nations such as Malaysia and Indonesia also recovered in 2017 and cost an average of US$7.20 per MMBtu, up from US$5.80 per MMBtu in 2016.

Prices rose sharply towards the end of 2017, driven by strong winter buying by major importers in Asia (particularly China), though have subsequently declined to around US$8.60 per MMBtu.

The latest analysis and report from Australian government forecasts oil-linked LNG contract prices in North Asia gradually rising.

Australia's export destinations have been further developing in the past year with 48 percent of shipments delivered to Japan, 29 percent to China, 11 percent to South Korea, 7 percent to Singapore, 3 percent to India and 3 percent to the rest of the world.

Other key facts to note about Australia are that as it advances to become the world's largest LNG exporter, its volumes have surged more than 40 percent since 2015 and most of the cargoes are sold on oil-linked contracts

The combined nameplate capacity of Australia's 10 LNG projects when they are completed in 2018 is 88 million tonnes per annum.

Australia's LNG projects and gas basins


**Australia has emerged as world power in natural gas and LNG**

"The real Japan Customs-cleared Crude (JCC) oil price, to which Asian LNG contract prices are often linked, is projected to increase from US$55 a barrel in 2017 to US$60 a barrel in 2023," said the report.

"LNG spot prices in Asia are expected to decline in the short term to US$5.60 per MMB as additions to global supply capacity outstrip growth in LNG demand over the next few years," it added.

"LNG spot prices are then projected to gradually recover from 2020 as supply growth slows, reaching an average in 2023 of US$7.90 per MMBtu," said the report.

With the United States emerging as a major source of new supply, US LNG exports are expected to add to downward pressure on Asian LNG spot prices over the next few years.

"The cost of delivering US LNG to Asia will be determined by the price for which US LNG exporters can purchase domestic gas for export, plus the cost of liquefaction and transportation to Asia.

## Henry Hub

"If current Henry Hub prices persist, and if tolling fees (fixed charges paid by LNG buyers that cover the capital costs of US LNG plants) are treated as a sunk cost, this could potentially be as little as US$5.00 per MMBtu," according to the Australian analysis.

"However, the capacity of the Panama Canal (the fastest route from US East Coast terminals to Asia) to accommodate growing LNG shipments could potentially limit growth in US exports to the region," stated the report.

That's as world LNG imports are projected to increase from 250MT in 2016 to 378MT in 2023.

Emerging Asian markets, led by China, and Europe are expected to drive demand growth.

Prospects for growth in the imports of Japan and South Korea are more limited.

"Despite robust growth in

*"LNG spot prices are then projected to gradually recover from 2020 as supply growth slows..."*


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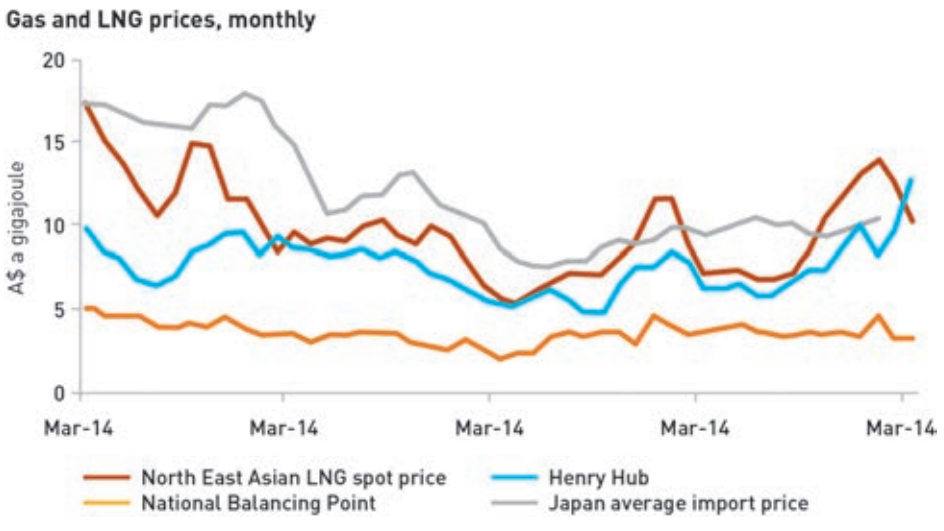


**Some key gas prices given in Australian dollars and gigajoules**

demand, the expansion in global LNG supply capacity is expected to outpace LNG demand over the next few years," said the report.

## Expansion

"Over-capacity in global LNG markets is expected to last through to 2020. The expansion in global liquefaction capacity will be concentrated in the US, Australia and Russia," it added.

The report explained that around half of all new capacity will come from the US.

"By the end of 2019, all six LNG projects in the US are expected to have commenced operations, bringing the combined nameplate capacity of US LNG projects to 67 MTPA, said the report.

Major new capacity additions are also expected in Australia and Russia. LNG capacity in Russia is expected to expand over the next few years as the Yamal project's additional Trains come on stream to total 16.5 MTPA. Qatar's LNG exports are projected to remain largely unchanged, though an expansion project is being considered to take output to 100 MTPA after 2023.

Exports from the Middle East nation have ranged from 72-77 MTPA and they are projected to remain in this range over the outlook period.

## Rebalancing

"From early next decade, however, the market is expected to begin rebalancing, as growth in global liquefaction capacity slows in the second half of the outlook period," said the report.

"There are few new projects in the investment pipeline, and they typically have lead times of five years or more between final investment decisions (FIDs) and completion," added the Australian report.

The report stated that other economies in emerging Asia are expected to make a large contribution to growth in global imports, including India, Pakistan, Bangladesh, Indonesia, Thailand and Singapore.

"Growth will be underpinned by low LNG spot and short-term contract prices and the availability of floating storage and regasification unit (FSRU) technology," it said. It sees floating storage and regasification units "FSRUs" and associated infrastructure being installed relatively cheaply and quickly compared with a conventional onshore import terminal, opening up the option for countries to import small volumes of LNG.

India's LNG imports are projected to grow substantially, climbing from 18MT in 2017 to 37MT in 2023 as new infrastructure is constructed.

## Share

"The Indian Government is aiming to increase the share of gas in the energy mix from 6.5 percent at present to 15 percent as soon as 2022, according to recent statements. India's domestic production is not expected to keep pace with the country's future gas needs, and LNG is expected to play an important role in meeting rising demand," said the report.

India currently has four LNG import facilities, and the Government has announced plans to authorise the building of 11 new import terminals on India's east coast over the next seven years.

The extent of India's future requirements will partly depend on progress on the Iran-Pakistan-India and Turkmenistan-Afghanistan-Pakistan-India pipelines, though these ventures are bogged down in political complications

The LNG imports of Japan, the world's largest buyer, are projected to fall from 86MT in 2017 to 76MT in 2023.

"Gas consumption in both the residential and industrial sectors is expected to remain relatively stable over the outlook period. At the same time, LNG is expected to face increasing competition in the power generation sector, which accounts for around two-thirds of Japan's gas consumption.

## Competition

"The Fukushima nuclear disaster in 2011 resulted in the closure of Japan's fleet of nuclear reactors. Just five of Japan's fleet of 42 nuclear reactors, with a combined capacity of 4.4 gigawatts, have recommenced operations by the first quarter of 2018.

"Four more reactors (combined capacity 4.7 gigawatts) had received final approval to restart. A further 21 reactors have applications in front of the Nuclear Regulation Authority for restart.

"The timing and scale of nuclear restarts remains a key uncertainty affecting the outlook for gas consumption in Japan and the region.

"To date, the pace of nuclear restarts has been slow, with nuclear energy continuing to face public opposition.

"There remain significant risks of delays and slippages in nuclear restarts," said the report.

Natural gas is also expected to face increasing competition in Japan and elsewhere in power generation from renewable energy sources.

In Japan, for example, between 2010 and 2016 renewable generation increased from 10 terawatt hours to 50 terawatt hours, with most of the increase led by solar and wind power. ■

# For the Record

**AIR LIQUIDE,** the France-based industrial gases company, said it was continuing to develop its latest boil-off gas reliquefaction technology onboard a second LNG carrier newbuild after successful trials on a first vessel at a shipyard in South Korea. The French company said it had commissioned a Turbo-Brayton-1050 system for BOG reliquefaction in January onboard the Samsung Heavy Industry-built LNG carrier "GasLog Genoa".

The vessel with 174,000 cubic metres capacity is being completed for Monaco-based LNG fleet operator GasLog. Air Liquide said its Turbo-Brayton technology is a reliable and economical cryogenic system that requires no maintenance. It is designed to re-liquefy boil-off gas from LNG carriers. The range goes from the TBF-175 to the TBF-1400, and also meets refrigeration and liquefaction needs for land applications at temperatures of between -250°C and -70°C. "Air Liquide has demonstrated the performance capabilities of the Turbo-Brayton-1050 (TBF-1050) cryogenic unit with results that exceeded the guaranteed values," said the company.

"A second TBF-1050 unit will also be commissioned on a sister vessel being built at the same yard," added Air Liquide. "The range also extends to equipment that is just as compact as this product but with even greater re-liquefaction capacity, like the TBF-1225 and the TBF-1400," said the company. Air Liquide has been widening its participation in the LNG technology market. In 2017 its US business signed a contract with Kinetrex Energy, the leading supplier of LNG in the US Midwest and a promoter of clean-fuel ventures. The French company's Engineering & Construction unit was selected by Kinetrex to upgrade the US firm's LNG production plant in Indianapolis in the state of Indiana. Kinetrex is a major supplier of LNG fuel to the vehicle and heavy-horsepower equipment markets. Air Liquide has also signed an agreement with Atlantic Gulf and Pacific Co., the LNG module maker and fabrication yard operator based in the Philippines, to cooperate on developing small-scale LNG infrastructure and distribution across Asia. AG&P and Air Liquide said they planned to offer fully integrated and cost-optimized solutions for LNG entrants with a focus on liquefaction, transportation and downstream infrastructure. AG&P's aim is to have access to Air Liquide's know-how in gas processing technology and patents and covers the French company's BOG management systems.

**AUSTRALIAN** coal-seam-gas-to-LNG export plants on Curtis Island near the port of Gladstone in Queensland have successfully tendered for an exploration and production licence for a key block in the Bowen Basin to boost natural gas supplies. Gladstone LNG plant operator, Santos said that it had been a successful bidder along with its GLNG partners, Petronas of Malaysia, Korea Gas Corp. and Total, as well as the Australia Pacific LNG plant of ConocoPhillips and Sinopec of China. The bid was for the state of Queensland's Petroleum Retention Licence (PRL) 2016/17-1A block of 86 square kilometres, located directly west of the Arcadia gas field in the Bowen Basin. LNG plants using onshore CSG as feed-gas require supplies from several thousand wells over the lifetime of the ventures. The plants in Queensland take substantial pipeline volumes from both the Bowen and Surat basins and their extensive CSG resources. "Being adjacent to the planned Arcadia project means we will be able to leverage existing infrastructure, reduce development costs and produce more gas," said Bill Ovenden, Santos Executive Vice President for Exploration and New Ventures. The exploration move comes as Santos is on track to supply about 11 percent of the expected East Coast's domestic natural gas demand in 2018. Australian regulators had raised concerns that the three CSG-to-LNG plants in Queensland had feed-gas needs that could leave the domestic market short and cause higher prices for consumers. Over the past six months companies such as GLNG, APLNG and the third plant owned by Royal Dutch Shell, the Queensland Curtis facility, have given assurances that the domestic market was not being neglected in terms of available gas.

"Access to new and existing supply sources in Queensland as well as new supply sources in New South Wales and the Northern Territory is critically important to enable us to continue to deliver competitive gas to the east coast domestic gas market," stated Ovenden. "Santos has been part of the Surat and Bowen Basin communities for more than 50 years and we want to continue to invest in the area for many years to come," he added. For the new licence in the Bowen Basin, the APLNG plant owners will hold about a quarter of the shares and the other three quarters are divided individually among the four GLNG stakeholders. The natural gas expansion plan comes as Santos, a stakeholder in two other Asia-Pacific LNG export ventures, has received a US$10.4-billion takeover bid from Harbour Energy, a subsidiary of EIG Global Energy Partners, a US private equity firm. Santos is Australia's second-biggest independent oil and gas producer after Woodside Petroleum and said that "in the interests of shareholders" it would engage in further discussions with Harbour, making its third takeover offer to Santos since August 2017. The Australian company, based in Adelaide, counts two major Chinese companies among its shareholders with a combined 15 percent held by China's ENN Group and the equity fund, the Hony Group. In addition to its GLNG stake, Santos owns shares in Australia's Darwin LNG plant in the Northern Territory and in the Papua New Guinea plant and its expansion project.

**BP** of the UK said it had approved the development with Oman Oil Company of the Ghazeer project in the Sultanate of Oman as the second phase of the giant Khazzan natural gas venture in the Arabian Peninsula nation that has helped revive LNG production. "The final investment decision for Ghazeer follows the successful start-up of Khazzan's first phase of development in September 2017," said BP. "This project, which started production ahead of schedule and under budget, is now producing at design capacity of around 1 billion cubic feet of gas a day (bcf/d) and around 35,000 barrels a day of condensate," added the UK energy major. The country's three liquefaction Trains at the facilities near Sur are expected to be at full capacity for the whole of 2018 after suffering several years of domestic gas shortages. The Omani government allocates Oman LNG supplies from various gas fields and the Khazzan field production has ended all future feed-gas concerns. The three Omani processing Trains are now almost at full capacity of 10.5 million tonnes per annum.

Additionally, in January 2018, Oman LNG signed a sales and purchase agreement with BP to supply shipments to the UK company's Singapore-based trading unit. Oman LNG said the agreement was for free-on-board (FOB) cargoes over a period of seven years starting immediately. BP will lift 1.1 MTPA of LNG, equivalent to around 18 cargoes a year, or about 126 over the period. "Following the successful start-up of Khazzan, we are pleased to announce the sanction of Ghazeer, BP's first project FID of 2018," said Yousuf Al Ojaili, President of BP Oman. "Through the transfer of industry-leading skills and technology from BP's global portfolio, we look forward to further developing this gas field that is expected to support Oman's energy needs for many decades to come," added Al Ojaili. Concern over meeting rising domestic demand prompted Oman LNG to announce in 2015 that it would have to divert its exported volumes from foreign markets and toward domestic consumers unless more gas was brought on stream. Oman's three liquefaction Trains come from the amalgamation of Oman's two previously separate operating companies, Qalhat LNG and Oman LNG, now run under one banner. The Ghazeer project is expected to come on stream in 2021 and deliver an additional 0.5 billion cubic feet per day and over 15,000 barrels per day of condensate production. "Drilling on the first three development wells has begun, following appraisal drilling on Ghazeer last year," said BP.

**CALOR**, the UK provider of LNG and of liquefied petroleum gas (LPG), has carried out the first fill-up for Swedish automaker Volvo's new LNG-powered truck at one of its stations in central England. The UK company re-fueled the Volvo truck from its supplies at the Donington Park Services off the M1 motorway in Derbyshire. Calor is a leading supplier of LNG and also the sole supplier of new BioLPG and delivers gases and fuel in bulk and by cylinder loads to over 350,000 commercial premises across the UK. The fueling operation came as Volvo began shipping its new LNG-powered trucks to the UK where Calor operates seven stations with LNG capability, including the Donington Park Services facility. "This network is set to play a vital role in supporting the growth of sustainable transports, such as Volvo Truck's new gas-powered vehicle," said Calor. The new Volvo FH LNG is a gas-powered truck with a powertrain based on Volvo's diesel-engine technology.

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With the 460 horse-power engine running on LNG, it is capable of delivering 20 percent less carbon-dioxide than a regular Volvo FH truck. "A fuel choice steadily growing in demand for companies operating long-haul heavy goods vehicles (HGVs), LNG offers significantly less CO2 emissions than conventional fuels such as diesel," said Calor. Martin Tomlinson, Head of Product Demonstration in the UK and Ireland at Volvo Group Trucks, stated that LNG was the fuel best positioned to quickly become a competitive and globally available alternative to diesel. "The development of our new FH LNG truck is the result of our commitment to transportation that is sustainable in the long term, through energy-efficient, competitive and future-proof solutions with a low climate and environmental impact," said Tomlinson.

The Volvo executive said that ensuring that the necessary infrastructure was in place to support the uptake of LNG was absolutely critical. "That's why Calor's investment in its LNG refueling network across the UK is so important," stated Tomlinson. Volvo and Calor said they believed moving to LNG would help cut the long-haul transport industry's dependence on diesel, lowering emissions and helping haulage companies meet increasingly tougher environmental demands. "The benefits of LNG for HGVs are clear," said Mark Gilks, Transport Specialist at Calor. "With leading truck manufacturers predicting that natural gas-powered vehicles could account for 20 percent of HGVs sold by the early 2020s, the future opportunities for LNG are really exciting," added Gilks. "For long-haul HGVs, LNG is a low carbon, competitively-priced fuel solution with good availability. Our publicly accessible LNG refueling network is the largest in the UK," he said. "As well as Donington, we operate stations in Lockerbie, Castleford in West Yorkshire, Lymm in Warrington, Grantham, Wolverhampton and Bristol. With plans to expand this network further already underway, we are committed to helping the industry towards a more sustainable future," the executive said.

**CHINA** Petroleum and Chemical Corp., the energy major also known as Sinopec and with LNG stakes including in the state of Queensland in Australia, said it was planning to boost its LNG capacity and supplies as well as its shale-gas assets. The company noted in its annual report that China's first shale-gas field Fuling, located in Chongqing municipality near the Yangtze River, has built up an annual capacity of 10 billion cubic metres. Sinopec's latest LNG import terminal in the northeast port of Tianjin received its first LNG cargo from Australia in February 2018. The terminal supplies natural gas to Beijing, Tianjin, Hebei and Shandong and is expected to effectively ease gas shortages in north China.

Sinopec is a shareholder in the Australia Pacific LNG plant on Curtis Island near the eastern Australian port of Gladstone with US major ConocoPhillips and local company Origin Energy.

The company said it expected to more than double its LNG import capacity over the next six years. Under its current strategy the state-controlled energy company will boost clean-energy and gas supplies to account for half of its total output by 2023. Sinopec will have 60 Bcm of natural gas supply capacity, which includes both imports and domestic production, by 2023. It produced 27 Bcm of gas in 2017. The group plans to add new receiving facilities for imported LNG along China's east coast to a total of 26 MTPA by 2023, up from the current 9 MTPA, including the terminals at Tianjin, Qingdao and Beihai. "We are going to expand the Qingdao terminal to 8 million tonnes and then 10 to 12 million tonnes by phases, the same goes for Tianjin," said Dai Houliang, Vice Chairman and President of Sinopec. Sinopec will also soon formally approve a plan to build a new import facility in the eastern Zhejiang province. The company also said in its strategy statement that it planned to build 1,000 natural gas filling stations by 2023 for trucks, buses and cars.

**CROWLEY** Maritime Corp, the US shipping and logistics company. said its liquefied natural gas subsidiary successfully completed the first loading of a commercial ISO container shipment from the new Maxville facility in Jacksonville in Florida. The first shipment amounted to nearly 11,000 gallons of LNG and was transferred at the new liquefaction and fuel plant owned by Eagle LNG Partner. Crowley said it loaded LNG into the ISO container and delivered it to the nearby Port of Jacksonville for ocean transport to support customers in Puerto Rico. With the addition of the new plant, Crowley and Eagle LNG have expanded the supply and availability of LNG services to customers in the US., Caribbean and Latin America. Crowley said that with the successful LNG tank container loading at the Eagle LNG Partners' Maxville facility, Crowley will be able to offer more flexible services and sourcing locations to supply customers.

"The new plant location means LNG can be easily produced and transported to the port all within the Jacksonville area," said Crowley's Matt Jackson, Vice President of the LNG business. "Not only will Crowley and Eagle LNG Partners provide a fuel source that decreases environmental impacts, Crowley can provide supply chain and engineering solutions that are resilient alternatives to traditional energy sources in Puerto Rico and other markets," explained the executive. The plant, which is in the Maxville area of west Jacksonville, has the capacity to produce up to 200,000 gallons per day of LNG, offering lower emissions than other fuels. The Maxville LNG Facility has a 1-million-gallon storage tank and a modern system to load fuel into ISO containers for quick deliver in trucks to the port. "We are very pleased that the first commercial load of LNG from the new Maxville LNG Facility is destined for Puerto Rico via ISO container," said Sean Lalani, President of Eagle LNG Partners. "This LNG plant is the embodiment of Crowley and Eagle LNG's commitment to the community in the North Florida region and Puerto Rico," he added. "Having the first commercial load sold to Crowley for routing through the Port of Jacksonville to Puerto Rico is only appropriate," he said. "The new Maxville LNG Facility is the first LNG plant to be operational in Jacksonville and features numerous design enhancements to allow us to send out LNG to the Port of Jacksonville and throughout the region safely and efficiently," stated Lalani.

**DOMINION** Energy said its US Cove Point LNG export plant on Chesapeake Bay in Maryland has formally started commercial operations five weeks after the first cargo was loaded. "After completing a planned maintenance outage, the facility has been ramping up to full production of LNG from natural gas provided by its export customers since late March," said Dominion. Cove Point has a nameplate capacity of 5.25 million tonnes per annum of LNG from a single Train compared with 18 MTPA being produced at Cheniere Energy's Sabine Pass plant in Louisiana where four Trains out of six are completed and on stream. Construction of the Cove Point liquefaction facility began in October 2014, following more than three years of federal, state and local permit reviews and approvals. The liquefaction plant will now produce LNG for the joint venture of Sumitomo Corporation and Tokyo Gas of Japan and Gas Authority of India under 20-year take-or-pay contracts. Cove Point plant owner Dominion began producing LNG at the end of January as it continued to put the facility through a comprehensive round of testing and quality assurance activities.

Shell North America provided the natural gas needed for liquefaction during the commissioning process and thus lifted the first LNG produced. The first cargo to be exported from only the second LNG liquefaction and export plant completed in the Lower 48 States arrived in the UK port of Milford Haven on March 21 and was only the second US shipment to be sent to Britain since the new wave of US LNG exports began in 2016. However, almost 40 shipments have been sent to other European nations, mainly in the Mediterranean region. The 138,100 cubic metres capacity vessel "Gemmata", operated by Shell Shipping, completed the unloading of the shipment from Cove Point, at the Dragon LNG terminal in Milford Haven, owned by Shell and Malaysian energy company Petronas. The US has shipped more than 300 cargoes since the first export plant outside Alaska began operations in February 2016 at Sabine Pass.

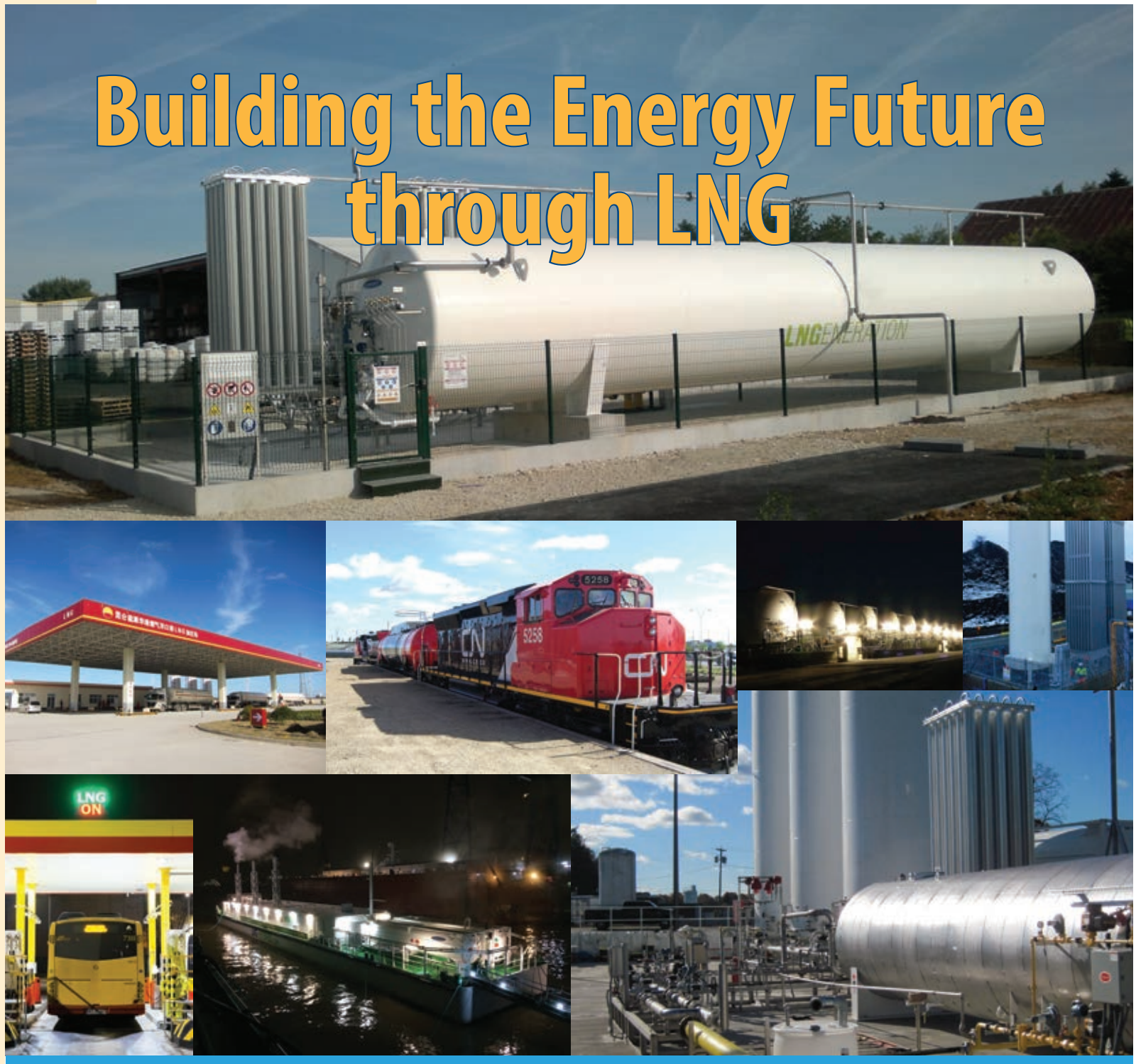
**ELENGY** of France, owner of three of the nation's liquefied natural gas import terminals, said it planned to build a truck-loading station at the Fos Cavaou facility near the Mediterranean port of Marseilles to boost distribution in the region. Elengy operates the Fos Cavaou terminal and the nearby Fos Tonkin facility as well as Montoir-de-Bretagne terminal in Western France. Montoir and Fos Tonkin currently operate LNG truck-loading bays and the new station at Fos Cavaou will improve availability of the fuel in the South. Elengy is a subsidiary of France's natural gas pipeline operator GRTgaz and both companies are controlled by the utility group Engie. The truck-loading facilities at Fos Cavaou will comprise of two loading bays. "With the one already in operation at the Fos Tonkin LNG terminal, this new station will triple the loading capacity of tankers at the Fos terminals," explained Elengy. "Works will start this summer for a commissioning during the first quarter

2019," it added. The Fos Cavaou project will bring additional capacity of 40 loading slots per day compared with 16 currently available at the terminal in Fos Tonkin. The two Fos terminals mostly handle imported LNG cargoes shipped from Algeria

The French truck-loading market started at Fos Tonkin in 2015 and has experienced steady growth, with nearly 1,000 loadings in 2016 and 2,000 in 2017. Elengy said the Montoir terminal on the Atlantic coast is experiencing the same level of demand and increased its capacity by 50 percent at the end of 2017 to 18 loadings per day after improving its infrastructure and schedules. In addition to building its truck-loading business, Montoir is also a trans-shipment base for LNG cargoes brought from the Russian Yamal plant in Siberia where French energy company Total is a shareholder. Montoir's other volumes come from nations such as Nigeria. "The transport of LNG by tank trucks allows the supplying of industrial sites not connected to the natural gas grid as well as other distributors of LNG for land and marine transportation," said Elengy. Elengy added that the latest truck-loading plan was key to developing the retail and wholesale LNG markets in southern France and Italy. The European Commission co-finances LNG transportation projects as part of its Connecting European Facility-Transport (CEF-T) programme.

**EXELON** Generation, the US utility, has signed an agreement to purchase the Everett LNG import terminal, located near Boston in Massachusetts and the oldest such facility operating in the US, from the North American subsidiary of French utility Engie. "Exelon looks forward to continuing Engie's mission of providing safe, reliable LNG to gas utilities, marketers, and other market participants throughout New England," said Exelon.

"Transaction closure is dependent upon regulatory review by the US Department of Energy for LNG import authorization and, as necessary, authorization from the US Department of



Justice," it added. "The transaction is expected to close in the fourth quarter of 2018," said the US company. No financial details on the deal were provided. The Everett terminal, also known as the Distrigas facility, is the longest-operating LNG import facility of its kind in the US. The terminal has connections with two interstate pipeline systems, as well as a local gas utility's distribution system. Everett was the first domestic LNG import facility to receive 1,000 cargoes and reached that landmark in 2010.

The Engie facility serves nearly all of the gas utilities in New England and key power producers, including a connection to a 1,550 megawatts power plant that serves the Greater Boston area. The terminal also has been an LNG supplier to a network of 46 utility-owned, above-ground LNG storage tanks that serve New England's gas storage needs. Because of geological conditions in the region, underground gas storage is not feasible. French energy major Total agreed in November 2017 to buy other major parts of Engie's global LNG portfolio in a transaction worth up to $2 billion. In January 2018, the Everett terminal received an LNG shipment from the Russian Yamal export plant in Siberia on board the French LNG carrier "Gaselys". The Yamal plant is operated by Russian natural gas company Novatek and Total has a stake in the joint venture. In connection with the Total LNG assets purchase from Engie, the French utility has asked the US Federal Energy Regulatory Commission for a temporary waiver to begin the process of releasing it from several long-term firm natural gas pipeline agreements. The sale of Engie's upstream and midstream LNG business to Total is being accomplished in two steps, it said. In the reorganization transaction, set to be completed in May, Engie would transfer to its subsidiary the natural gas purchase and sales agreements, financial agreements, interests in various LNG carrier vessels, LNG sales contracts, and regasification capacity in Europe. In the second step of the transaction, expected to be completed around July 1, the ownership interests of the subsidiary Global

LNG SA would be transferred to Total, giving it 100 percent ownership interest in Engie's upstream and midstream LNG business.

**EXXONMOBIL** Corp., operator of the Papua New Guinea liquefied natural gas export plant near Port Moresby, has announced a more than 80 percent increase in estimated reserves in a key natural gas field underpinning the LNG expansion in the Oceania nation and said it would have a lasting economic impact for the people of PNG. The US major said its P'nyang field in PNG had increased its resource base by 84 percent to 4.36 trillion cubic feet since a previous field assessment was carried out in 2012. ExxonMobil said the independent recertification study by Netherland Sewell and Associates follows the successful completion in January 2018 of the P'nyang South-2 well, located in the Western Province of PNG. "The results support ExxonMobil's discussions with its joint venture partners on a three-Train expansion concept for the PNG LNG plant with one new Train dedicated to gas from the P'nyang and PNG LNG fields and two Trains dedicated to gas associated with the Papua LNG project," explained the US company. "The increase in the estimated resource size of the P'nyang field helps illustrate the tremendous growth opportunities for our operations in Papua New Guinea," said Liam Mallon, president of ExxonMobil Development Co. "We are working closely with our joint venture partners and the government to progress the P'nyang field development proposal and secure the licenses needed to develop this world-class resource," added Mallon.

The PNG LNG plant was temporarily closed as related infrastructure was steadily brought back on stream after being damaged in February's earthquake. The PNG LNG expansion project would add approximately 8 million tonnes per annum of production and double current output to 16 MTPA. "This investment would extend our gas pipeline infrastructure into the country's Western Province and have a meaningful and

lasting economic impact for Papua New Guinea and its people," stated Mallon. The P'nyang gas field is located within petroleum retention license 3, which covers 105,000 acres (425 square kilometres). ExxonMobil operates the licence with a 49 percent interest in the block. Australian-listed company Oil Search has a 38.5 percent interest and Japanese energy company JX Nippon has a 12.5 percent stake. The partners in the Papua LNG venture linked to the expansion are also seeking to commercialize the Elk-Antelope fields located in petroleum retention licence 15 in the Gulf Province of PNG. ExxonMobil affiliate holds a 37.1 percent interest in the Elk-Antelope assets while French energy major Total and Oil Search have 40.1 percent and 22.8 percent stakes respectively.

**FLORIDA GAS** Transmission received a regulatory permit for its East-West Project to construct lateral connections to serve demand in the Gulf Coast, including from liquefied natural gas export plants. Florida Gas first filed an application with the Federal Energy Regulatory Commission in October 2016 for a certificate for the East-West Project to construct around 25.2 miles of lateral and connection pipeline facilities, four new meter stations and auxiliary facilities located in Texas and Louisiana. The East-West Project will enable Florida Gas to provide an additional 275,000 per million British thermal units per day to the project shippers, Royal Dutch Shell and Japanese energy company and utility Jera Co Inc., which have signed 10-year and 15-year agreements respectively. Florida Gas stated that the two project shippers, Jera Energy America and Shell North America, have agreed to pay negotiated rates for their supplies and have LNG interests on the Gulf Coast. They also expect the project to be completed by around September 2018. The Florida pipeline company stated that construction of the East-West Project should take about three months and work should begin as soon as possible to avoid disrupting natural gas services to other energy customers in Texas and Louisiana, citing one refinery in particular.

"Florida Gas's system is divided into two service regions, the Market Area, which lies within Florida, and the Western Division, which extends from Texas to the Alabama-Florida state line," the FERC noted. Florida Gas has said it was vital that it received a certificate for the project as soon as possible because current supplies of natural gas to the Motiva plant near Port Arthur in Texas, the largest gasoline refinery in the US, will perform pipeline integrity testing in the summer of 2018 that will require its pipelines to be removed from service and hydro-tested. "In order to ensure that service to this strategic and vital refinery is not interrupted, the East-West Project must be in-service by that time," said Florida Gas. The regulator ruled that the East-West Project costing around $69 million must be available for service within two years and comply with several environmental conditions. In Acadiana Parish in Louisiana, the project would create the Eunice-ANR Lateral and a metering and regulating receipt point, among other connections on the Gulf Coast. In Louisiana's Calcasieu Parish, it would create the Gillis-Trunkline receipt point and in Jefferson County, Texas, it would create the Port Arthur Lateral and Port Arthur-Motiva delivery point. The FERC order said station piping and valves on the Florida Gas 24-inch diameter mainline in Orange County, Texas, are also included in the East-West plans to enable bi-directional flow on the mainline.

**FLUXYS**, the Belgian energy and natural gas pipeline company as well as owner of the Zeebrugge liquefied natural gas import terminal, has taken over the LNG bunkering concession in the port of Antwerp in Belgium. The Belgian company said it would now make LNG available as an alternative fuel for ships and barges in one of the Port Authority's "key initiatives" to make the port's activities more environmentally friendly. "Fluxys will add a permanent LNG bunkering facility by the end of next year to complement the existing mobile (truck-to-ship) bunkering service," said the company. Antwerp is Europe's second-largest seaport after Rotterdam and is located at the upper end of the tidal estuary of the Scheldt river, offering access to container vessels and dry-bulk cargo ships. It will also be offering LNG to a new generation of barges being constructed for the inland river trade in Europe and in the Amsterdam, Rotterdam, Antwerp energy barge trading triangle. Antwerp is connected to a network of rivers and canals, enabling barges to reach destinations outside Belgium, including the Netherlands, Germany, Austria, Switzerland and France. "For ships and heavy-duty trucks LNG is the ideal alternative in the transition to lower greenhouse-gas emissions and better air quality," said Fluxys.

Fluxys explained that over the next 18 months it would construct at Antwerp's quay 526-528 the infrastructure needed for barges and smaller seagoing ships to fill up with LNG at a permanent facility with LNG storage. "For this purpose, the company is working closely with G&V Energy Group, which will also build an LNG filling station for trucks on the same site," said the Belgian company. The G&V Group is active in Belgium's fuel stations and storage market after taking over the Esso brand in the Brussels and Flanders regions. Fluxys said that mobile LNG bunkering is now available to ships by way of quayside tanker trucks. In order to provide LNG bunkering in the port of Antwerp, companies must have a permit from the Antwerp Harbourmaster's Office. The ports of Antwerp, Amsterdam, Rotterdam, Zeebrugge, Bremen, Le Havre and Marseille are currently collaborating under the auspices of the International Association of Ports and Harbours to develop a suitable accreditation process, known as the LNG Accreditation Audit Tool. The first draft of this international safety standard was welcomed at a meeting in April in Amsterdam by a broad group of stakeholders. In the meantime, Fluxys is hoping to build its Antwerp LNG fuel business as it has at the port of Zeebrugge. "Captains as well as LNG suppliers can reserve a slot using the online platform lngbunkeringportofantwerp.com to moor at quay 526-528 and take on LNG," said Fluxys of its Antwerp service.

**GASLOG**, the US-listed and Monaco-based shipping line whose fleet numbers 27 LNG carriers, has told investors in New York that the LNG shipping market was evolving with more fragmentation, inter-basin trading and value maximization helping to increase shipping intensity. Executives from GasLog and its US-listed affiliate GasLog Partners gave their update to investors and industry analysts in presentations in the city's Pierre Hotel. "GasLog has expanded and upgraded its fleet of LNG carriers while delivering outstanding operational and safety performance,' said Paul Wogan, GasLog Chief Executive. "This growth has been underpinned by our strong commercial relationships and a significantly strengthened balance sheet as a result of the success of GasLog Partners as a funding vehicle for the group. "We are pleased this delivery has been recognized through a leading total shareholder return relative to our peers over the period," stated Wogan. The CEO said the outlook for the LNG shipping remained positive, driven by growing demand for LNG and an increase in shipping activity. GasLog's carrier fleet has long-term charters with Royal Dutch Shell inherited by the Anglo-Dutch company when it acquired BG Group of the UK. "Our scale and operational and commercial capabilities position us well to benefit from an expanding and tightening market. "We are excited by the opportunity to more than double our consolidated EBITDA over the next five years, and to unlock significant value upside from an increase in asset values, cash flows, earnings and shareholder returns," stated Wogan.

The GasLog CEO also said that the LNG market fundamentals were strong and forecast demand growth to drive supply expansion post 2020. The company said it expected a tightening of the LNG shipping sector, with additional volumes travelling greater distances and driving a strong recovery in shipping rates. GasLog noted in its previous earnings that LNG shipping companies were hoping for higher multi-year charter rates to be influenced by the headline spot rates that reached a peak of $82,000 per day through the end of the fourth quarter of 2017. Andy Orekar, CEO of GasLog's New York Stock Exchange-listed affiliated GasLog Partners, said the company's growth strategy had delivered strong financial returns since the initial public offering of shares in 2014. "With clear alignment of interests between GasLog and GasLog Partners, a visible, multi-year pipeline of growth opportunities and continued access to capital, we believe GasLog Partners represents a differentiated and compelling MLP investment opportunity," said Orekar. "Our recently announced acquisition of 'GasLog Gibraltar' and of an intercompany loan repayment are each expected to be accretive to distributable cash flow per unit, supporting the Partnership's year-on-year distribution growth guidance of 5 percent to 7 percent in 2018," he added. GasLog Partners posted a 2 percent decline in fourth-quarter revenues to $77.34 million compared $78.62M in the same three months a year ago. The partnership also completed three LNG carrier acquisitions from GasLog, raised $281.1M in net equity proceeds and retired $153.8M in total debts.

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**GASSCO**, the Norwegian natural gas pipeline operator and one of the main competitors to LNG, said it would in future provide more details on planned maintenance, unplanned incidents and the flow of gas in and out of the transport system. "We want to enhance what we report about the Norwegian gas transport system," explains Kristin Kinn Kaste, Executive Vice President for system operation at Gassco. Gassco boosted supplies by 8 percent last year, sending a record 117.4 billion cubic metres of gas through the pipeline system from the Norwegian Continental Shelf to mainland Europe and the UK. The Norwegian company's pipeline volumes last year set a clear record for the four decades since Norwegian gas exports began and it now aims to improve information flow for customers. "Among other steps, we'll be lowering the threshold for providing information about transport reductions related to planned maintenance," said Gassco. "Furthermore, the initial notification of incidents will be brought forward so that the general public is informed at the same time as the gas sellers," the company added. The threshold for reporting planned incidents on flow.gassco.no is being lowered from 20 to five million standard cubic metres of gas per day. This limit also applies for notifying unplanned incidents.

In addition to providing information on gas flow out of the system, Gassco will now be giving details about gas flowing in as well. "That will indicate the balance in the transport system. However, the balance can vary without affecting daily deliveries to customers. This could be caused, for example, by planned variations in rates over a day from fields and at delivery points. "We've had a good process with users of the transport system to identify solutions which ensure greater openness and more coordinated information about system operation," added Kaste. The Gassco system comprises more than 8,800 kilometres of high-pressure pipelines, gas treatment plants, riser platforms, receiving terminals and crossover pipelines securing a high degree of flexibility

and gas routing alternatives. "With this degree of flexibility and the long distance from the production units to market where the gas is delivered, the physical transportation time varies between 3 and 7 days depending on flowrate and field location," explained Gassco. There is currently above 65 producing units delivering into the system, with variations in flow due to changing nominations, events at the field or events in the transportation system. "Reductions with a short duration or a minor impact are dealt with through operational flexibility, since the field availability is given as a daily volume," it said. "Consequently, many of the events will have no volume impact, i.e. shippers are not curtailed and gas is delivered as planned," added Gassco. The pipeline gas supplies from Norway is the equivalent of 87 million tonnes of LNG, which combines the most recent annual LNG output of Qatar and that of Algeria. Both nations supply large LNG volumes to Western Europe. The Norwegian deliveries compare favourably in terms of energy security with the more than 180 Bcm shipped by pipeline to Western Europe by Russia's Gazprom. Gassco said that under its new system, publications of unplanned events will be performed before information is available on the volume impact of the event. The publication of real time flow includes entry flows, exit flows and system flow balance. "This balance may vary during the day due to variations in field production, flow rates and use of operational flexibility. Changes in system flow balance could occur in normal operation or due to planned or unplanned events," it said.

**GE**, the US power plant and machinery company, said it had successfully completed the testing of an 80-megawatts induction motor at its factory in northeast France to serve the LNG industry liquefaction plants. The testing took place at GE's factory in the French city of Nancy with the motor operating at a high voltage of 11 kilovolts and running from 2,500 to 4,000 rotations per minute. GE said its latest innovation targeting LNG processing facilities will have a high

motor efficiency rating of up to more than 98 percent. The US company has been retained by several LNG plant developers in the US with plans to construct plants along the Gulf Coast with more than 25 million tonnes per annum of output. "In the liquefied natural gas industry, reliability is the name of the game," said Ed Torres, the head of GE's Marine and Oil & Gas division, part of its Power Conversion business. "A mid-size LNG facility could suffer costs of $4 million a day through unplanned downtime," explained the GE executive. "Running 99.5 percent of the time, electric motors are absolutely critical assets to LNG operations. I am proud to announce that our new 80-MW induction motor is now ready to serve the LNG industry with unrivalled high power, reliability and efficiency," stated Torres.

GE said the huge item of machinery was one of the world's largest induction electric motors, leapfrogging from the 22-MW induction motor, the next highest power rating induction motor with a rotating speed up to 4,000 rpm. The US company said that compared to its traditional 75-MW two-pole synchronous peer, the new motor has 10 times fewer rotating parts and therefore can significantly increase operational reliability, leading to 48 percent more uptime and greater availability. "The simpler design also results in a 30 percent smaller footprint and weight, an essential advantage that provides flexibility when integrating the equipment into existing plant infrastructure," said GE. The company said that electrification had breathed new air into the energy landscape due to its high reliability, efficiency and reduced environment footprint. "Our latest innovation in the induction motor technology showcases yet another key milestone on the electrification journey of the LNG industry," said Azeez Mohammed, President and Chief Executive of the Power Conversion business.

**GREEK** shipping company Arista and its partners are planning to place an order in China for 20 bulk carriers to be powered by LNG as part of a joint development programme also involving companies such as Royal Dutch Shell and the American Bureau of Shipping. Arista was founded in 2007 to specialize in managing the worldwide ocean transportation of dry-bulk cargoes, including commodities such as iron ore, coal, grain and alumina. Arista, through a subsidiary called Forward Ships then started a Joint Development Project together with globally established industry leaders aiming to combat global ship emissions in the most effective manner. Presented in 2015, the company's project identified the potential of LNG as a marine fuel and engaged in a research and development programme leading to the beginning of the process of ordering the 20 vessels. A letter of intent has been signed between Forward Maritime Group Inc. and Jiangsu Yangzijiang Shipbuilding group for the construction of up to 20 bulk carriers with deliveries between 2020 and 2023. Jiangsu Shipbuilding is one of the largest private shipyards in the world and was the first Chinese shipbuilding company to be listed on the Singapore stock exchange. The company has yards on the Yangtze River in Jiangsu Province and located about 170 kilometres from the cities of Shanghai and Nanjing.

"With three large dry-docks and six large and medium size slipways, the shipbuilder has an annual output of 6 million deadweight tons and has large container vessels, bulk carriers, multi-purpose vessels and offshore engineering equipment," said the Arista statement. The shipbuilding group manages and operates several Chinese companies, including Jiangsu New Yangtze Shipbuilding and Jiangsu Yangzijiang Offshore Engineering Co. Project Forward is a Joint Development Project (JDP) formed and led by Arista Shipping in 2013 to combat global ship emissions by promoting the adoption of liquefied natural gas (LNG) as a marine fuel, and by suggesting the design of a Kamsarmax-size bulk carrier. The Arista-led plan is for the construction of Kamsarmax-size bulk carriers that would reduce the cost of transportation at sea, modernize the shipping industry and define the new standard of vessel for the International Maritime Organization's sulphur cap of 0.5 percent for fuel being brought in from 2020. "The partners in this project comprise a prestigious and powerful group of industry leaders," added the statement. They are the US classification society, the American Bureau of Shipping; fuel supplier Shell Western LNG; French LNG storage technology company Gaztransport & Technigaz (GTT), Finnish propulsion company Wartsila and Finland-based ship design and engineering firm Deltamarin.

**HUBEI** Energy Group of China plans to invest in liquefied natural gas infrastructure on the Yangtze River and has signed an accord with the city of Zhejiang to encourage fuel use by river traffic in the next three to five years. The Chinese cities of Shanghai and Zhejiang have LNG import terminals and can form a hub on the Yangtze River delta for LNG distribution inland. China also has a network of small-scale liquefaction plants and LNG can be trucked to distribution points along the river. Hubei Energy, a state-controlled company, said in a statement to the Shanghai stock exchange that it planned to invest an initial 2.6 billion yuan ($411 million) in building LNG fuel stations. The company added that it signed a letter of intent with the Zhejiang authorities for cleaner energy use by providing facilities for vessels to take gas fuel on board, including by shore-to-ship transfer systems. In the next step, Hubei Energy, in cooperation with the state-owned Three Gorges Group, plans to accelerate construction of LNG infrastructure along the river and develop an LNG fueling system from Shanghai to the city of Chongqing in central China.

The company said it expected to invest in LNG fuel capability projects over a period of three to five years when there will be more vessels built to be powered by LNG or on a dual-fuel basis. The first Chinese dual-fuel river vessels are now in operation, several on the Yangtze in Hubei province. The majority of inland river vessels on the Yangtze are small-scale product and cargo carriers ranging from 3,000 tonnes to 5,000 tonnes in capacity, mostly fueled by heavy oil and diesel. However, it is estimated that if 10 percent of the cargo vessels transiting the Yangtze made the switch to dual-fuel propulsion and part use of LNG then carbon-dioxide emissions could be drastically reduced. China declared three emission-control areas in 2016 on the Yangtze River delta, the Pearl River delta and Bohai Rim, initially on a voluntary basis, though with future enforcement expected. At present China has about 20 LNG bunkering pontoons, the main method of bunkering LNG-fueled inland waterway vessels, as well as four LNG bunkering barges and three small-scale LNG carriers for fuel distribution around the coast or inland on the Yangytze or Pearl rivers.

**HYUNDAI** Merchant Marine Co., the largest South Korean shipping line, said it would place an order by June for 20 container ships worth around $2.8 billion with the country's major shipbuilders for vessels having exhaust-cleaning technology or LNG fuel capability. "Hyundai Merchant will select a shipbuilder or a couple of builders by June to build twelve 20,000 twenty-foot equivalent unit (TEU) container ships and eight 14,000 TEU container carriers," the company said in a statement. "The company has sent a request for proposals to Hyundai Heavy Industries Co., Samsung Heavy Industries Co. and Daewoo Shipbuilding & Marine Engineering Co," it added. Hyundai Merchant plans for the newbuilds to comply with the International Maritime Organization regulations from 2020 whereby ships must restrict sulphur oxide emissions to a maximum 0.5 percent of fuel content from the current limit of 3.5 percent. Ship owners have a number of choices of how to comply with the new low-sulphur specifications, with LNG fuel being one of them, along with

## Diary of events

**May**
**Flame Gas and LNG conference**
14-17 May 2018
Hotel Okura, Amsterdam
The Netherlands
https://energy.knect365.com/flame

**June**
**27th World Gas Conference**
25-29 June 2018
Washington Convention Center
801 Mount Vernon Place Northwest
Washington, DC 20001, USA
http://wgc2018.com

**September**
**Gastech**
17-20 September, 2018
Fira Gran Via Conference Centre
Barcelona, Spain
www.gastechevent.com

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also establishing a maritime industry promotion agency to support the placing of orders for new ships in the form of investment or guaranteeing the ship purchase programme.

**JAPAN** Petroleum Exploration Co. (Japex) said it began commercial operations at Japan's newest LNG import terminal at Soma Port, located in Fukushima Prefecture in eastern Japan, near where the nuclear disaster happened seven years ago this month. Japex's Soma terminal gives Japan 35 regasification facilities and satellite terminals in its network as it consolidates its position as the world's biggest LNG importer. Commissioning at the terminal had begun in December 2017 with the receipt of a cargo from Petronas of Malaysia. Japex had been a shareholder in the cancelled Canadian LNG export project, the Pacific Northwest venture planned for British Columbia and in which Petronas was the largest shareholder. The Soma terminal was constructed by the leading LNG engineering company JGC Corp., better known for building overseas export plants. It has a single storage tank with 137,000 cubic metres of capacity and two berths to accommodate imports as well as shipments from small-scale domestic LNG carriers. A contract has also been awarded for an additional storage tank.

The LNG terminal is part of a venture that will include a gas-fired power station for Fukushima. Soma is a coastal city located in the Hamadori area of Fukushima and partially destroyed by the tsunami caused by an earthquake in 2011 that led to fires and explosions at the nuclear plant owned by Tokyo Electric Power Co. The city of Soma is 45 kilometres from the destroyed Fukushima nuclear plant. The LNG facility is located at the No.4 wharf of Soma Port and is in one of the important areas for Japex's domestic natural gas supply network. "Over 60 years since its establishment, Japex has been conducting exploration and production of natural gas domestically and has been supplying natural gas and LNG to our clients such as local gas distribution companies, business consumers and fuel for power generation," said the company. Japex said the terminal would complement its domestic natural gas pipeline supply network in the region, including the Niigata-Sendai Gas Pipeline. "With increased domestic demands for natural gas in recent years and improved stability with our gas pipeline network between the Japan Sea side to the Pacific Ocean side of the country, we made a decision to construct the Soma terminal and a pipeline connecting the terminal and the Niigata-Sendai line," added Japex. "The No. 2 storage tank and additional vaporization equipment are planned to commence operations in 2020 at the same time as the commencement of the Fukushima Natural Gas Power Plant under construction since October 2017 adjacent to the terminal," it said.

**LNG LTD,** the developer of two North American LNG export projects, said it had agreed to extend the financial closing date for an offtake agreement with Meridian LNG Holdings Corp., the owner of an import venture proposed for offshore Cumbria in northwest England. The developer, with fully approved plans to build the Magnolia LNG plant at Lake Charles in the US state of Louisiana and at Point Tupper in Richmond County in the Canadian Atlantic Coast province of Nova Scotia, said the Meridian binding offtake agreement would now run until June 30, 2018. "This three-month extension allows both parties to maintain commercial flexibility," said LNG Ltd., a company listed on the Australian Securities Exchange. "All other provisions of the governing agreements not specifically amended by this extension remain in full force and effect," the company added. "LNG Ltd's agreement with Meridian LNG was signed on 23 July 2015 and included firm capacity rights at Magnolia for up to 2 million tonnes per annum for an initial term of 20 years with an option to extend by a further five years," the company explained. The Chief Executive of the UK-based Meridian LNG project is Roger Whelan who formed Liberty Natural Gas in the US in 2008 and subsequently merged it into a unit of the Canadian equity fund West Face Capital.

Whelan is also Project Director of Global Energy Ventures and its Atlantic compressed natural gas project announced in May 2017, aimed at securing substantial market access to the UK, a market that is increasingly reliant on imported gas from European pipelines and delivered LNG. The UK LNG facility would be offshore the Port of Barrow, currently owned and operated by Associated British Ports. Meridian also has a joint development agreement with Hoegh LNG of Norway for the operation of two floating storage and regasification units for the project in England. Meridian has been assembling strategic assets in recent years to develop a business in the global gas value chain. In addition to its liquefaction tolling agreement with the Magnolia plant and its joint development accord with Hoegh to invest in FSRUs and LNG carriers, it has a gas sales agreement with German utility and energy company Uniper. LNG Ltd said recently it was continuing to focus on marketing efforts to secure more tolling agreements for Magnolia and for the Canadian venture called Bear Head LNG. Its Magnolia project engineering, procurement and construction contract with the joint venture comprising KBR of the US and South Korea's SK Engineering and Construction has also been extended in the past year.

**MAN** Diesel & Turbo, the German marine engine maker has supplied the propulsion for the world's first LNG-fueled bulk carrier delivered in South Korea to work on the Asian nation's coastal trade. The bulk carrier, the "Ilshin Green Iris", has been delivered from the Hyundai Mipo Dockyard in Korea to its local owner Ilshin Logistics. The 50,000 deadweight-ton bulk carrier is powered by a single MAN B&W 6G50 electronically-controlled, gas-injection (MEGI) two-stroke engine. The ship and its propulsion have been classed by Lloyds Register and the Korean Register and in compliance with the International Gas Fuel (IGF) Code. The "Ilshin Green Iris" has been chartered by South Korean steelmaker, POSCO, to transport limestone cargoes in the local Korean trade. "We are very pleased to be part of this exciting project and to see our dual-fuel ME-GI engine win favour in yet another market segment," said Bjarne Foldager, Vice President of Sales for the two-stroke business at MAN Diesel & Turbo. "We look forward to following its progress," he added. The "Ilshin Green Iris" has a Type 'C' LNG fuel tank with a capacity of 500 cubic metres and comprised of a material – high-manganese austenitic steel – newly developed by POSCO that is specially designed for cryogenic LNG and liquefied gas-storage applications. MAN said its successful MEGI engine has now accounted for more than 200 orders to be installed in LNG carriers, container vessels, and now bulk carriers. "The ME-GI engine provides ship-owners and operators with a peerless solution within environmentally friendly and high-efficiency, two-stroke technology," said the company.

"The negligible methane slip of the MEGI engine makes it the most environmentally friendly, two-stroke technology available," added MAN. The German engine and turbomachinery maker is also building a new test facility in South Korea in partnership with Hyundai Heavy Industries that will include improving LNG equipment and dual-fuel engines. The test and gas facility will be located at the Port of Ulsan in South Korea at Hyundai's Engine & Machinery Division (HHI-EMD) works and is scheduled to begin operation in early 2019. "It will be the first test engine with online remote control, supporting MAN's digitization strategy. In this respect, the test engine will also be connected to MAN's research and control centre in Copenhagen, enabling the company's research engineers to closely follow and enhance the testing of future engine technologies," said MAN. The company, which has operational facilities in Denmark, said the MAN-Hyundai venture will expand research and development test capacity as part of its strategy to improve dual-fuel gas engines using LNG and other traditional fuels. The company has chosen Hyundai as its partner as it is among the leading global shipbuilders for LNG carriers and also has plans to construct a new wave of gas-powered vessels for container, cargo and energy companies to meet emission-control regulations.

**MEXICO** said that was developing a set of privately-owned pipelines and other natural gas projects, including a floating LNG import facility, as part of a historic build-out of the nation's gas infrastructure. The plans include Mexico's first natural gas trading hub, five inter-connection compressor stations, border expansions and proposals for an underground storage facility. Mexico's state-owned Centro Nacional de Control del Gas Natural (Cenagas), operator of Mexico's main natural gas transmission network called Sistrangas, is overseeing the programme and the energy regulator, the Comision Nacional de Energia (CRE), is providing technical guidance. The five inter-connection projects would be linked to a planned floating storage and regasification unit (FSRU) and also to the national pipeline network. Two interconnection ventures are part of efforts by Cenagas and the CRE to ease

exhaust-cleaners known as scrubbers and low-sulphur fuel. "Hyundai Merchant will have all the new ships either equipped with the latest scrubber system that reduces sulphur oxide or will operate on liquefied natural gas," it said. The company stated that the 20,000 TEU container ships will be used on the Asia-North America routes and the eight 14,000 TEU container ships will be operated on routes to the east coast of the US.

Hyundai Merchant, which earns 80 percent of its revenues from the container ship business and the remainder from the bulk-carrying business, has an operating fleet of 90 ships comprised of 52 container vessels and 38 bulk carriers. Twenty of the ships are owned outright by Hyundai while the others are part of business alliance contracts with the world's leading container shipping operators, Maersk Lines Mediterranean Shipping company (MSC). The South Korean government said on April 5 it would back orders for about 200 vessels in the next three years to help its shipping and shipbuilding industries suffering from a slump in global demand and losses that forced restructuring at the largest companies. These government-backed orders were to include eco-friendly, energy-efficiency container ships to comply with the IMO sulphur regulations. South Korea's main shipyards, owned by Daewoo, Hyundai and Samsung have been forced to undergo rescue programmes worth some $10.3 billion since 2016. The government is also seeking a new owner for Daewoo Shipbuilding, which is currently undergoing an overhaul led by the state-run Korea Development Bank as part of the reshaping of the nation's shipbuilding sector. Following the bankruptcy of Korea's Hanjin Shipping, orders for the shipping industry were cut and the tonnage of the deepsea container fleet was reduced by half. "We have prepared a set of comprehensive measures to support the shipping and shipbuilding industries grappling with a protracted slump, intense competition and environmental regulations," said the government. The ministry plan is to build 140 bulk carriers and 60 containers. It is

natural gas shortages in the southeast, namely on the Mayakan pipeline serving consumers on the Yucatan Peninsula. That pipeline's operator, a subsidiary of French energy company and utility Engie, is developing an interconnection with 350 million cubic feet per day to the national pipeline network. The other project is a 390 MMcf/d link to the planned Pajaritos FSRU venture led by state energy company Petroleos Mexicanos (Pemex) at Coatzacoalcos in the state of Veracruz on the Gulf of Mexico and including imported LNG volumes. A tender is being conducted for the charter for three to five years of an FSRU LNG vessel and the construction of a 14-kilometres pipeline connected to the national network.

"Any new capacity will be made available to the market through an open season," said Cenagas. Three other natural gas projects would connect the system to pipelines under construction on the Gulf Coast, in the northwest and in central Mexico. These include the Monte Grande's 500 million cubic feet per day (MMcf/d) interconnection with the Sur de Texas-Tuxpan marine pipeline in Veracruz. Another is the Encino project, a 70 MMcf/d link with the El Encino-La Laguna pipeline in the state of Chihuahua, bordering the US. A third is the Zapotlanejo interconnection with 200 MMcf/d of capacity linked to the Villa Reyes-Guadalajara pipeline in the state of Jalisco on the Pacific Coast. The first two interconnections are expected to start up later in 2018 while the third has a completion date of October 2019. The development efforts by Cenagas and the CRE in the southeast also include the reconfiguration of the Cempoala compressor station in Veracruz. The project would reverse flows at the station and allow gas in central Mexico to move further south after the Tuxpan marine pipeline comes into service at the end of 2018. "For the third review of the five-year plan, Cenagas evaluated the technical feasibility of five interconnections as well as other projects that the market has shown interest in developing," said Cenagas. Since the previous plan was published, Cenagas has held its first open season for capacity on the national pipeline system, launching the market's capacity reservation regime in July 2017. The existing contracts with some 50 shippers for 97 percent of the system's 6.3 Bcf/d operating capacity are now up for renewal in 2018. Cenagas has also launched an electronic bulletin board for the information flows on the network grid and is looking at plans for developing strategic underground storage facilities for a total of 45 Bcf of natural gas.

**PAVILION** Gas, the Singapore LNG import licence holder, part of the portfolio of the city-state equity fund Temasek and its Pavilion Energy company, received its inaugural LNG cargo from Middle East supplier Qatargas for the local natural gas market. Singapore's Energy Market Authority (EMA) awarded the LNG importer licence to Pavilion Gas in 2017 after a tender process. The LNG cargo was supplied under a spot contract and was unloaded at the Singapore LNG import terminal on Jurong Island. "Pavilion Gas is delighted to commence LNG imports into Singapore," said Mohammed Hassan Marican, Chairman of Pavilion Energy. "This demonstrates the company's readiness and commitment to supply to the domestic market," he added. "We would like to express our appreciation to our partners, suppliers and customers for their support over the years. As we move forward, Pavilion Energy will work closely with our partners and customers to grow our business in Singapore, even as we continue to expand our regional and global initiatives," the Chairman stated. Frederic Barnaud, Group Chief Executive of Pavilion Energy said that the Pavilion Gas subsidiary would be reliable and competitive in supplying Singapore from a portfolio of LNG and piped natural gas from Qatar, Indonesia, the US and international markets. "Our unique blend of diversified supplies, operational excellence and commercial expertise enables us to be a trusted partner in Singapore and globally," said Barnaud. Pavilion Gas was appointed in October 2017 as one of the two LNG importers to supply volumes to Singapore customers. Under the licence, Pavilion will have exclusivity to market up to 1 million tonnes per annum of LNG for domestic use for a period of three years.

The second supplier is Shell Eastern Petroleum, a subsidiary of Royal Dutch Shell. The Anglo-Dutch company had acquired in 2016 the previous supplier to the Singapore domestic market, BG Group of the UK. Both Pavilion and Shell were chosen in preference to another Singapore company, Sembcorp Industries, for the contracts to supply Singapore volumes linked to the US benchmark Henry Hub price or the Singapore Exchange's SLING index price. Natural gas accounts for more than 95 percent of Singapore's energy needs and comes in the form of pipeline imports from Indonesia and LNG shipments. The Singaporean government intends to rely exclusively on LNG imports by 2024 when the remaining pipeline supply contract with its Asian neighbour will have expired. Singapore LNG Corp., the operator of the Jurong island import and re-export terminal that began operations in 2013, has said a fourth storage tank is scheduled to be completed in the next couple of months as the facility broadens its activities as a regional hub. The fourth tank has even larger capacity than the other three at 260,000 cubic metres and will offer LNG traders more options and flexibility. The facility currently has three storage tanks in service, each with a capacity of 188,000 cubic metres and 540,000 cubic metres in total. The terminal is owned by the Singapore Energy Authority and is located on a 40-hectare plot at the southern tip of Jurong Island. When it started up five years ago, the facility became the first open-access, multi-user LNG regasification terminal in Asia. Its current services include receiving shipments for Singapore's own energy needs and additionally offering storage and re-loading for exports. SLNG is also building a fuel bunkering business in cooperation with the Maritime and Port Authority of Singapore.

**QATARGAS**, the leading liquefied natural gas producer, has signed an accord to cooperate in the LNG business with the main electric power generating company of Thailand, including being a future supplier of additional volumes to the Asian nation. A memorandum of understanding was signed between the Qatar Petroleum LNG production company and the Electricity Generating Authority of Thailand (Egat) covering procurement, transportation and floating storage and regasification units (FSRUs). "In addition, the MoU includes a scope for the possible supply of LNG to the Kingdom of Thailand," said Qatargas on the agreement signed in the Qatari capital Doha. Qatargas is already a regular supplier of LNG to the nation's only import facility at Map Ta Phut in the Rayong Province of Thailand, operated by the Thai energy company PTT. The Qatari company has supplied shipments amounting to 2 million tonnes per annum since 2015 under a 20-year supply agreement.

However, Thailand is exploring the expansion of its LNG import network, including the use of FSRUs. "Qatargas is delighted to enhance our relationship with the Kingdom of Thailand, and to share our expertise with EGAT, Thailand's leading power utility," said Saad Sherida Al Kaabi, President and Chief Executive of Qatar Petroleum and Chairman of the Qatargas board. "Qatargas has a rich history of collaborating with world-class organizations, and we look forward to working with Egat to identify and evaluate future opportunities to supply Egat with Qatari LNG," added Al Kaabi. Kornrasit Pakchotanon, Chairman of Egat, said the Thai company was pleased to collaborate with Qatargas, the world-leading LNG supplier. "We look forward to learning from their expertise and developing the best business solution together," said Pakchotanon. As part of the MoU, a committee of representatives from both companies will be formed to execute the terms of the MoU. Khalid bin Khalifa Al Thani, Chief Executive of Qatargas, said the global LNG supplier was pleased to sign the Thai accord. "On behalf of the team, I would like to convey our deep commitment to working with Egat and identifying world-class LNG solutions which meet their business needs. Once identified, we look forward to the prospect of building a long-term supply relationship," stated Al Thani.

**SEMBCORP** Marine of Singapore has secured a contract from energy and LNG engineer TechnipFMC for a floating production, storage and offloading (FPSO) unit for offshore Israel's latest East Mediterranean natural gas and oil development. Scheduled for completion in the fourth quarter of 2020, the FPSO will be deployed at the Energean-operated Karish and Tanin deepwater field developments, about 90 kilometres from the Israeli coast. "The contract includes fabrication and integration of various topside modules, as well as installation of owner-furnished equipment," said Sembcorp. The FPSO's hull will be 227 metres in length and 50 metres wide, with a total oil storage capacity of 800,000 barrels and gas production capacity of 8 billion cubic metres per annum. Independent oil and gas company Energean, with operations offshore Greece and Egypt, has also signed a contract with Stena Drilling of Sweden for the development of the Karish field. The Karish development programme, which targets supplying gas to the

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growing Israeli market, includes the drilling of three development wells.

Energean bought rights to the Karish and Tanin fields from Israel's Delek Group in 2016 for $148 million and has signed a contract to supply up to 1.5 billion cubic metres of gas annually to Dalia Power Energies, a private concern that plans to compete with Israel Electric Corp. However, it is still seeking customers for a further 1.5 Bcm of pipeline natural gas. Energean had to submit a field development plan for the Karish and Tanin gas fields to the Israeli Petroleum Commissioner. Energean's Israeli subsidiary holds 100 percent of Karish and Tanin, which combined have 2.7 trillion cubic feet of natural gas and 41 million barrels of oil equivalent of light hydrocarbon liquids in place. The Tanin gas field, located about 120km offshore Israel, will follow the development of Karish, with a total of six wells that will be connected to the same FPSO. Both Noble Energy of the US and Israel's Delek are currently developing the larger Leviathan field, which has around 22 trillion cubic feet of reserves compared with the onstream Tamar field they control with 11.25 Tcf of reserves. Another East Med natural gas player Egypt is on its way to ending LNG imports and possibly restarting exports after the start-up at the end of 2017 of the Zhor gas field, fast-tracked into production by licence holder Eni of Italy. Egyptian Minister of Petroleum Tarek El Molla said recently that the increasing production from the Zhor field meant Egypt would have no need of LNG imports by the start of 2019.

**SHELL** has formally exited a natural gas project offshore the Gaza Strip and handed over control to the Palestine Investment Fund (PIF), the Palestinian Authority's investment arm, to seek its own energy success in an East Mediterranean field with proven reserves. The Palestinians reached an agreement with Shell and its subsidiary acquired in 2016 as part of the BG Group takeover. The acquired Shell unit, BG Great Britain Ltd, discovered the Gaza Marine natural gas field in the year 2000 and estimated reserves at around 1 trillion cubic feet. The Gaza Marine Field, located about 20 miles offshore the Gaza coast, has been regarded as a prime opportunity for the Palestinian Authority to join the East Med gas bonanza and receive a major source of income to reduce reliance on foreign aid and hand-outs. Natural gas fields in the region have been so prolific that Egypt and eventually Jordan will soon be able to halt LNG imports. The Israeli Leviathan and Tamar gas fields in the same area hold a combined 40 Tcf of reserves and already supply pipeline supplies to Jordan and one of their other customers will soon be the Palestinian Authority. The Tamar field already produces gas for Israel and Jordan and the Leviathan project is currently under development. The main shareholders in the Israeli fields are Noble Energy of the US and Israel's Delek Group. Egypt, a former supplier of natural gas to Israel, has also recently brought on steam large natural gas fields such as the Zohr block offshore the East Med.

"Shell's divestment is related to its corporate strategy and global portfolio management priorities," said a Palestinian statement. "Following completion of this transaction with Shell, the Palestine Investment Fund received rights for 90 percent of the Gaza Marine licence," it added. The Palestinians said that together with its investment partner, the Arab project development company CCC Oil and Gas Ltd., a subsidiary of the Consolidated Contractors Co. (CCC), they would focus their efforts on advancing gas sales agreements and preparing a field development plan with the selected operator. "Under the new structure approved by the (Palestinian) cabinet for the Gaza Marine License, PIF and CCC will each hold 27.5 percent of the development rights pursuant to existing options under the license agreement, and an international operator will hold 45 percent following its approval by the Palestinian government," explained the statement. The Palestinians said that the new structure gave momentum to the development of one of Palestine's most vital, strategic assets. The Gaza Marine gas project is central to the Palestine Authority's vision for domestic energy security backed by a thriving energy sector. The Gaza Marine gas field would satisfy the Palestinians' market demand, fueling power plants in Gaza and Jenin and enabling a future Palestine state to become an energy exporter. "For PIF, Gaza Marine's development is part of a comprehensive energy program which includes upstream, gas transportation infrastructure, and power generation," the statement added. The program is led by a company called Massader, the PIF's arm for energy and infrastructure, whose portfolio also includes investments in solar power and renewables, broadband and conventional power generation.

**US LNG** distribution company NuBlu Energy has opened a small-scale liquefaction plant with a modular design along the Mississippi River at Port Allen in Louisiana to supply high-horsepower fuel users in the region, including trucks and inland waterway vessels. NuBlu Energy said the facility was open for commercial production with an initial output of 30,000 gallons per day and 100,000 gallons of permanent storage on the west bank of the Mississippi near Baton Rouge. The company said the plant was expandable to 90,000 gallons per day of output when the regional LNG fuel needs increase. The NuBlu customers will include mainly long-haul trucks, marine fuel operators, peak-shaving needs at power plants and other clean-fuel users. The building of the small-scale Port Allen liquefaction plant with modules is part of a general expansion of capacity for the US wholesale market in fuel for trucks and shipping, with bunker ships also operating on the Gulf coast. There is also greater use of LNG as fuel for ships servicing the offshore oil and gas market.

The single load-out is designed to accommodate the loading of trucks and ISO storage tanks. The plant itself uses patented technologies. NuBlu spokesman Josh Payne said the company aimed to make "local" supplies more available to the emerging retail and wholesale markets. "Completion of the Port Allen project represents the successful commercialization of the NuBlu technology," said Payne. "We are also bringing another option to the LNG market. This plant lays the foundation for efficient LNG production on a modular level preserving the efficiencies recognized by larger production facilities. This gives the domestic and international community a much smarter and economical solution by making LNG local," he added. NuBlu said each major piece of equipment is a modular, skid-mounted design making the plant easily deployable in remote regions or areas not typically suited for fuel projects.

**WOODSIDE** Petroleum, the operator of two liquefied natural gas plants in Western Australia, has joined nine other global oil and gas majors in signing guiding principles that commit it to further reduce methane emissions from the natural gas assets it owns. The initiative was launched in November 2017 by ExxonMobil Corp. and Royal Dutch Shell, along with several other majors who put forward joint proposals to reduce greenhouse-gas emissions from natural gas production. The energy companies have drawn up a road map to advance towards reducing methane emissions from natural gas wells, pipelines and consumption. Woodside also agreed to encourage others across the natural gas value chain, from production to the final consumer, to do the same. The Australian company is a one-sixth shareholder in the Northwest Shelf LNG plant, as well as operator, and owns the Pluto liquefaction facility on the Burrup Peninsula of Western Australia. The new industry-led effort is targeting methane, the main component of natural gas. When natural gas is burned, it releases less carbon dioxide than oil or coal. However, methane that is not burnt escapes into the atmosphere during the production process, for example, from leaks in pipelines.

"This commitment forms part of wider efforts by the global energy industry to ensure that natural gas continues to play a critical role in helping meet future energy demand while addressing climate change," said Woodside. "Since natural gas consists mainly of methane, a potent greenhouse gas, its role in the transition to a low-carbon future will be influenced by the extent to which methane emissions are reduced," added the Perth, Australia-based company. The guiding principles focus on continually reducing methane emissions; advancing strong performance across gas value chains; improving accuracy of methane emissions data; advocating sound policies and regulations on methane emissions; and increasing transparency. In addition to ExxonMobil, Shell and now Woodside, the other signatories to the pact are BP of the UK, Italy's Eni, Russian natural gas company Gazprom, Spain's Repsol, Statoil of Norway, French major Total and German oil and gas company Wintershall. The signatories have said that implementing all of the cost-effective methane abatement measures worldwide would have the same effect on long-term climate change as closing all existing coal-fired power plants in China. Analysts say that companies such as ExxonMobil, Shell and BP are also becoming more engaged with issues related to climate change after increasing pressure from investors and threats of future legal challenges. Previous industry efforts have often had a broad scope that included ways to cut carbon emissions. A recent International Energy Agency study found that an estimated 76 million tonnes of methane are emitted every year from global oil and gas operations. ■

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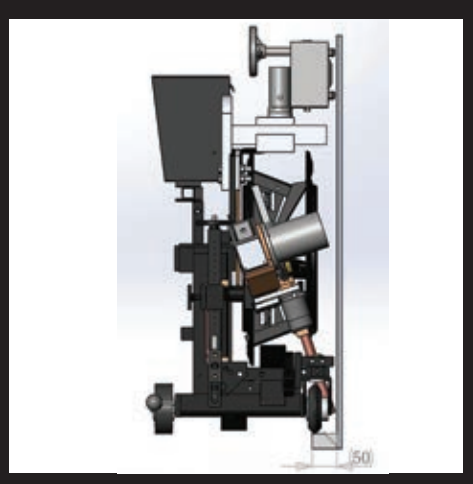

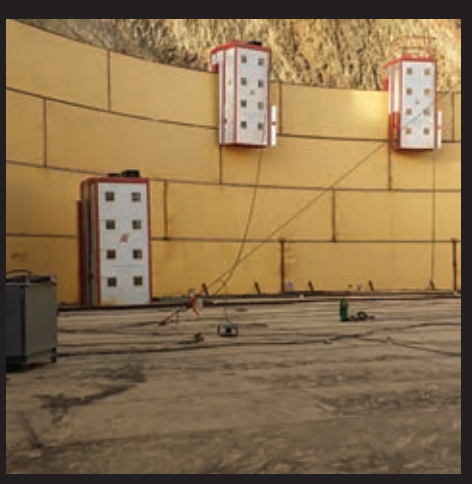

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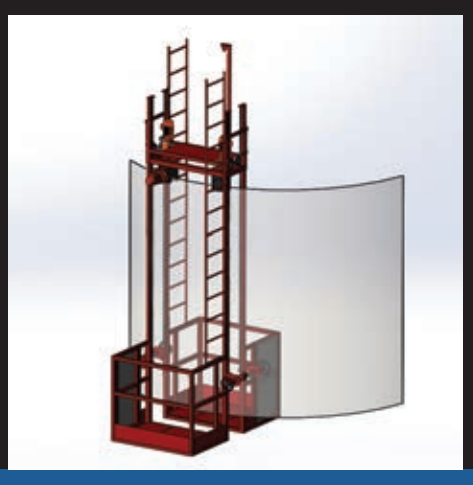


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# Gasum of Finland gives overview of recent LNG developments in growing Nordic supply market

*Finland-based company sees help from Finnish, Swedish and EU authorities for promoting gas sector*

Gasum Group, the Finland-based Nordic gas sector operator whose assets include Skangas of Norway, is advancing as a liquefied natural gas player in the Nordic market.

”Our Group’s financial performance improved in line with our expectations,” said Gasum Group Chief Executive Johanna Lamminen.


**Finland’s Tornio Manga LNG terminal is the nation’s second regas facility to be completed**

## Revenues

“Our revenue increased by 23.4 percent, enabled by growth in every one of our business areas of natural gas, LNG and biogas.

“In accordance with our strategy, we promoted cleaner transport on land and at sea,” she stated.

The consumption of natural gas in the Nordic region among the customers of Gasum increased by 13 percent, mainly due to the colder than normal temperatures experienced in February.

“Natural gas is a logistically flexible form of energy the use of which is easy and quick to control.

“Natural gas enables significant emission cuts compared with coal and oil and acts as a bridge to a low-carbon future while the alternative energy market is still developing to its full potential,” said Lamminen.

## Opening

“This makes us well-equipped to continue preparations for the opening up of the Finnish gas market from the beginning of 2020,” she added.

“Demand for LNG has increased in Nordic shipping. Our LNG business performed bunkering operations at an accelerating pace,” said the CEO.

“LNG is the cleanest available fuel for maritime transport. It is rapidly becoming a more and more commonly used cost-effective option suitable for all types of vessel.

“Switching to LNG fully eliminates sulfur and particulate emissions and cuts nitrogen oxide emissions by up to 85 percent.

“LNG use also reduces carbon dioxide emissions by at least 20 percent. Using LNG as a marine fuel also makes vessels compliant with the coming emission regulations of the International Maritime Organization (IMO) and the European Union.

“The completion of our Northern joint project, the Manga LNG terminal (Finland), is getting very close, and we are preparing for the launch of the terminal’s commercial use,” said Lamminen.

## Marine

In the LNG business, the positive development seen in 2017 in marine fuel market growth also continued.

The revenue of the LNG business totaled €55.5 million. Revenue growth was also affected by the commissioning of the bunkering vessel “Coralius” that was completed last year.

“This resulted in an increase in the number of ship-to-ship bunkering operations in the North Sea, Skagerrak area and the Baltic Sea.

“Ship-to-ship bunkering competencies provide a clear competitive advantage for the business. The vessel strengthens Gasum's position as the leading player in the small-scale LNG market,” said the company.

“The sales volumes of the LNG business unit during the period under review totaled 1.6 TWh, which is at the same level as during the corresponding period a year earlier.

“The revenue of the business unit accounted for 14 percent of the Group revenue and the share is expected to increase,” added Gasum.

There was also a naming ceremony in the quarter for the first small-scale Ice Class 1A Super LNG carrier with 18,000 cubic metres of capacity, the “Coral EnergICE”.

Designed and built to operate in the Baltic Sea conditions, the “Coral EnergICE” will be used to transport LNG to the two Finnish terminals in Pori and the Manga Tornio.

“The new vessel enables disruption-free deliveries in all weather conditions,” said Gasum.

## Network

“We also strengthened our gas filling station network by opening a station for gas-fueled cars in conjunction with the IKEA store in Espoo, Finland,” said the company.

“The new filling station was an important new move and part of the circular economy collaboration between Gasum and IKEA Finland where biogas is produced from food waste of Finland’s IKEA restaurants.

“In this context, gas filling stations are also constructed at IKEA stores, enabling the use of biogas in IKEA Finland’s own operations as well as for its transport partners and consumers.

“We also launched the expansion of the heavy-duty vehicle filling station network into the Nordics in Sweden and Norway,” it added.

Key figures and events through March 31, 2018:

- Revenue €390.5 million, up 23.4 percent year on year (2017: €316.4M)
- Sales of natural gas business €322.4M (2017: €249.5M)
- Sales of LNG business €55.5M (2017: €54.9M)
- Sales of Biogas business €12.3M (€12.0M)
- Operating profit €72.8M (2017: €55.8M)

Gasum stated that its main strategy remains the expansion of natural gas use and gas markets in the nations of the northern EU.

“The company is purposefully advancing its strategy of expanding the gas market and building a bridge towards a carbon-neutral society on land and at sea in the changing operating environment,” said Gasum.

## Vision

“Renewal is a key element of Gasum’s strategy. Its mission is ‘cleaner energy’ and our vision is ‘leading the Nordic gas ecosystem’. The four components of the strategy form the foundation of our operations: promoting sustainable development, selling competitive gas, developing a smart-gas system and building a new Gasum,” it explained.

The most recent period under review saw several actions to promote the strategy.

“The unbundling of transmission activities required by Finland’s new Natural Gas Market Act has been taken

forward, and advocacy work has been conducted in accordance with the strategy relating to the taxation of natural gas.

"Gasum intends to expand the filling station network to also serve heavy-duty vehicles in Sweden and Norway thanks to the investment support received," said the company.

## Operations

"In accordance with the company's human resource management focal areas, Gasum will continue the development of employee wellbeing, good management and leadership, and safety and security," it added.

The general operating environment and aims in Finland are to phase out carbon use in energy production by 2029.

"Measures planned by the Government to achieve this include amending the taxation of combined heat and power (CHP) production so that the competitiveness of natural gas against coal will improve.

"This would contribute towards reductions in coal use, particularly in the Helsinki Metropolitan Area without new further investments. "The details of the tax amendments are currently undergoing preparation by public officials and, if realized, would take effect at the beginning of 2019," said Gasum.

The company said the position of gas as a road vehicle fuel has continued to strengthen. In the first months of the year, more gas-fueled vehicles were registered in Finland.

The improved take-up of vehicles and the development of filling station infrastructure in Finland was accelerated by the fixed-term legislation on the scrapping incentive and on support for gas-car conversions that entered into force at the beginning of 2018.

## Valid option

The number of LNG-fueled vessels has continued to increase globally in maritime transport, although the total market share is still rather modest.

"In addition to maritime transport, LNG is regarded in Europe as a valid option for heavy-duty vehicles.

"As part of its promotion of alternative propulsion systems, the European Commission is likely to continue granting investment support for the promotion of the distribution infrastructure for LNG-fueled road and maritime transport in the coming years.," the company pointed out.

EU member states are promoting a transition in heavy-duty transport into LNG use through national support mechanisms.

In early 2018, the Swedish Environmental Protection Agency granted Gasum around €9.3 million in investment subsidy enabling the construction of up to 16 new LNG filling stations for heavy-duty vehicles in Sweden.

The European Parliament earlier voted on the Renewable Energy Directive creating a framework for promoting renewable energy until 2030.

"As regards biogas, the proposed Directive is on the whole favourable and will continue to facilitate efforts to boost the position of biogas in the various segments," said Gasum.

Finland's new Natural Gas Market Act entered into force on January 1, 2018. Gasum has continued preparations for the opening up of the gas market scheduled to take place on January 1, 2020. The market rules were finalized in January, and the Ministry of Economic Affairs and Employment launched their consultation phase, which ended on April 6, 2018.

The unbundling of transmission activities required by the Act has commenced in accordance with a plan drawn up late last year.

"Gasum's transmission business will be unbundled into a separate company using the ownership unbundling model by January 1, 2020.

"As regards the entire year, natural gas consumption is anticipated to remain at the previous year's level and security of supply has been excellent," said Gasum.

Gasum is 100-percent owned by the State of Finland. The shares are held at 73.5 percent by the state-owned Gasonia Oy and 26.5 percent directly by the State of Finland.

The Gasum Board of Directors comprises Chairman Juha Rantanen and ordinary members Jarmo Väisänen, Timo Koponen, Päivi Pesola, Charlotte Loid, Elina Engman and Stein Dale. ■

# Norwegian company outlines safe and reliable route to successful transition to LNG solutions

*Børge Nogva of Høglund Marine Automation explains development of technology to go with cleaner fuel*

As of early 2018, there were 119 LNG-powered vessels in operation, with a further 125 on order, a number that will continue to grow as we edge closer to 2020 when the need to switch to alternative fuels will necessitate a change one way or another.

Arjan Starast, head of business development Europe and the Middle East for Marine LNG at Shell, said that he expects 2018 to be "the year when we see a transition from niche to mainstream for LNG fuel".


**Growing global fleet includes Sirius Shipping's 'Seagas' in move to cleaner industry and ports**

## Players

If we look at what's on the cards for 2018, it's easy to see why.

One of the main factors here is the entry of big players into the market, arguably creating a tipping point for LNG shipping.

French shipping line CMA CGM ordering nine ultra-large LNG-fuelled containerships, and cruise line fleet owner Carnival Corp. recently ordering its second LNG-fuelled cruise ship, will undoubtedly pave the way for many other similar decisions.

Orders such as these will provide the necessary impetus for both the fleet and infrastructure to begin this transition - which can be seen across sectors.

In the latest of a flurry of firsts, Hyundai Mipo Dockyard and Ilshin Logistics have delivered what is said to be the world's first bulk carrier powered by LNG.

A survey conducted by German trade fair organiser, Hamburg Messe and Congress revealed that 44 percent of respondents cited LNG as their first choice when contemplating newbuild orders.

## Transition

"There is no way around the energy transition in the maritime sector. The increasing number of newbuilding orders and retrofits shows that LNG is gaining ground. The future of low-emission shipping has long begun," said Reinhard Lüken, General Manager of the German Naval Architecture and Ocean Engineering Association.

The bunkering infrastructure to supply this need is developing quickly. The volume of LNG bunkered in Rotterdam in 2017 rose to 1,500 tonnes, from 100 tonnes in 2016.

## Terminals

By 2020, nine of the world's top 10 oil bunkering ports are expected to be offering LNG bunkering. One of the most important parts of this supply chain are LNG bunkering vessels.

While there are currently five in existence, there are a further 10 on order.

Høglund automation solutions are present on three of these vessels, including Shell's specialised LNG bunkering vessel, "Cardissa", built at STX in Korea, and the "Seagas", a bunkering vessel owned by AGA and operated by Sirius, that has completed around 1,200 bunkering operations successfully.

This coincides with a global increase in demand for LNG, particularly in Asia. According to recent data from Shell, global LNG demand grew by a market-defying 29 million tonnes to 293MT in 2017, with LNG buyers continuing to demand greater flexibility through shorter and smaller contracts.

This is not only driving growth in the LNG-carrying fleet, but changing it: the greater flexibility needed in the market is increasing the proportion of the fleet that is made up of smaller carriers and FSRUs.

This seismic shift in the global fleet offers a unique opportunity to not only increase the efficiency and environmental compliance of the fleet, but also represents a chance to dramatically increase the reliability of the fleet.

This requires the industry to pay attention to the often-overlooked field of automation. While the age of autonomous vessels is not yet upon us, there are still numerous processes on board that are autonomous - and this increases all the time as vessels become smarter and incorporate more digital solutions.

## Systems

A vessel's automation system can be compared to a nervous system: it carries information between the "organs" of a vessel, such as alarm and monitoring, propulsion systems, power management, cargo handling systems etc., ensuring that operations are seamless, efficient, and that any issues are identified immediately.

Conversion to LNG requires that new automation systems are installed on a vessel, to deal with the challenging properties of the new fuel.

For example, on traditional diesel electric vessels, the power capacity of a diesel generator is fixed, and the engine is responsive to load changes, while gas-driven equivalents are more reliant on stable load and good quality fuel to operate.

## Perspective

This can cause issues such as knocking, which may require engine shutdowns to resolve. A properly automated Power Management System can avoid such problems and deliver enhanced engine performance.

Similarly, at newbuild, the complexity of handling LNG requires a dedicated, and specialised approach to automation.

For example, LNG carriers can use boil-off gas to burn in their engines, which is processed through a fuel gas control system. This requires the automation supplier to create additional interfaces between the gas plant and the cargo control and monitoring systems.

From an automation perspective, it's clear that extra integration is beneficial here. For instance, the alarm handling of

the cargo area has obvious commonalities with the rest of the ship.

While making automation more complex, it will make the operation of the ship easier and safer, provided a comprehensive set of specifications is determined from the start of the project.

If automation fails, the consequences can be costly – particularly because software bugs can be so difficult to track down and replicate.

At best, if something goes wrong, crew may find a manual workaround, taking up valuable time and missing out on potential efficiencies. At worst, a failure could lead to mission-critical delays.

Unfortunately, this factor is often overlooked - and when it comes to selecting an automation provider, cheap, generic systems are often selected.

## Economic

Partly, this is because automation systems are relatively competitively priced compared with other systems, such as propulsion. Similarly, a lack of electronics expertise among naval architects and yards means there is far more focus on mechanical than electrical engineering.

The requirements for automation systems at the commissioning stage are consequently brief, and do not specify how simple faults can be avoided.

The gulf between the impact of the system and its cost is significant - while it represents only a very small percentage of a total project cost, it can have a much larger impact on risk reduction in operation.

At Høglund, we see this gap in understanding as unacceptable. In aviation and automotive fields, much greater focus has been given to automation systems.

In contrast, shipping as an industry is yet to fully benefit from automation best practice. This is why we are committed to working with our partners to raise their understanding of automation and help create systems that are suited to the challenges of modern shipping.

## Bunkering

For LNG bunkering vessels like the "Cardissa", Høglund worked closely with our partners to design automation systems from scratch and support throughout design, build and testing phases.

In doing so, we have worked with many of the segments' first movers in LNG fuel including Shell, Sirius Shipping and Bernhard Schulte Ship Management.

We establish various principles to ensure that automation can deliver the reliability and performance that is necessary in the long term.

One of these is to ensure that all systems are based on hardware that we know will be available in 15 years' time, allowing users to operate knowing that spares and replacements will be available in the future. We also aim to use parts from a single supplier.

Without specific direction from the owner and designer, yards will in most cases choose various PLC (Programmable Logic Controller - the small processors that govern automated systems) suppliers for a range of functions.

## Data access

This adds unnecessary complexity for the owner, who will have to work with multiple suppliers when it comes to maintenance and upgrades.

Having consistent, readily available software and hardware makes much more sense for systems that will support vessels throughout their lifetimes.

We also ensure that users of automation systems have access to the potential goldmine of data they generate.

This can take the form of Playback systems, which record all inputs and outputs for a system, and storing up to a year's worth of data. This allows users to play back events and analyse any faults, which is invaluable for diagnostics, optimisation and bug-fixing.

The data gleaned from automation systems can also be used to create a full picture of a vessel's performance through a ship performance monitor (SPM), combining fuel consumption, power consumer data, and vessel data such as average speed, distance sailed, wind speed and direction, draft and trim. This allows calculation of emission data such as NOx, SOx and CO2.

## Specifications

There is no reason that principles such as these should not be included in specifications for retrofits or newbuilds.

As the barriers to an LNG transformation fall, we can ensure that the growing LNG fleet is one that drastically reduces time lost due to substandard automation systems, and efficiencies missed due a lack of understanding of how automation systems function.

LNG carriers and barges use boil-off gas to burn in their engines, which is processed through a fuel gas control system.

This requires additional interfacing between the gas plant and the rest of the ship, drastically increasing the complexity of the automation. Certain types of bunkering barges must also extract vapour from receiving ships to use as fuel, a field in which Høglund has proven itself as an innovator.

These unique systems can be integrated with the following to optimise efficiencies and allow users universal access to all systems:

- Power management
- Alarm and control
- Emergency shutdown
- Gas and fire detection systems

Høglund has also created a unique simulator to train crew in operating the automated systems of an LNG bunkering vessels, demonstrating their commitment to raising the understanding of the importance of automation in this vital segment.

## Integration

The company's engineers can advise on the optimum level of integration for automated systems.

Many systems currently advertised as "integrated" may simply be composed of separate connected systems, with hardware and software from separate suppliers.

This means that upgrading a system can be problematic, as not all parts of the system can be upgraded at once, leading to compatibility issues. It can also be difficult to identify faults in these systems.

By using integrated systems built on easily replaceable hardware from the same supplier, Høglund can alleviate these problems, increasing reliability and reducing lifecycle costs.

High levels of redundancy ensure minimal downtime for maintenance or upgrades.

Høglund delivers full automation solutions including Power Management, Cargo Control and Ship Performance Monitor for all types of LNG carriers. ■

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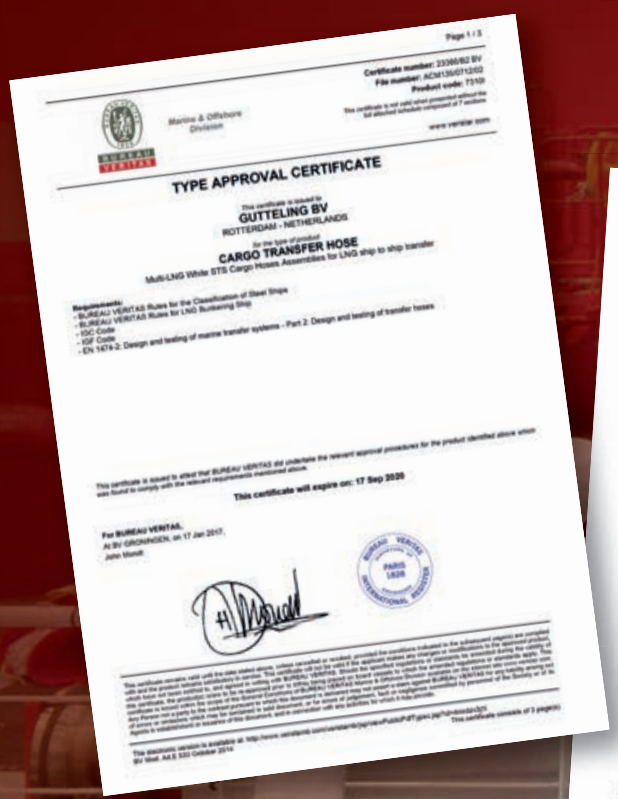


TYPE APPROVAL CERTIFICATE

This certificate is issued to
GUTTELING BV
ROTTERDAM - NETHERLANDS

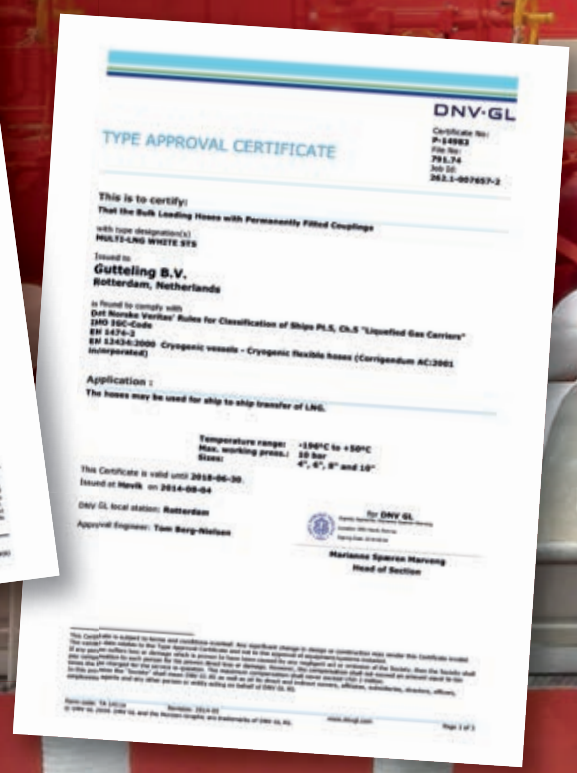
for the type of product
CARGO TRANSFER HOSE
Multi-LNG White STS Cargo Hoses Assemblies for LNG ship to ship transfer

Requirements:
- BUREAU VERITAS Rules for the Classification of Steel Ships
- BUREAU VERITAS Rules for LNG Bunkering Ship
- IGC Code
- IGF Code
- EN 1474-2: Design and testing of marine transfer systems - Part 2: Design and testing of transfer hoses

This certificate is issued to attest that BUREAU VERITAS did undertake the relevant approval procedures for the product identified above which was found to comply with the relevant requirements mentioned above.

This certificate will expire on: 17 Sep 2020

For BUREAU VERITAS,
At BV GRONINGEN, on 17 Jan 2017,
John Vlotdijk



DNV·GL

TYPE APPROVAL CERTIFICATE

Certificate No: P-14983
File No: 791.74
Job Id: 262.1-007657-2

This is to certify:
That the Bulk Loading Hoses with Permanently Fitted Couplings

with type designation(s)
MULTI-LNG WHITE STS

Issued to
Gutteling B.V.
Rotterdam, Netherlands

is found to comply with
Det Norske Veritas' Rules for Classification of Ships Pt.5, Ch.5 "Liquefied Gas Carriers"
IMO IGC-Code
EN 1474-2
EN 12434:2000 Cryogenic vessels - Cryogenic flexible hoses (Corrigendum AC:2001 incorporated)

Application :
The hoses may be used for ship to ship transfer of LNG.

Temperature range: -196°C to +50°C
Max. working press.: 10 bar
Sizes: 4", 6", 8" and 10"

This Certificate is valid until 2018-06-30.
Issued at Høvik on 2014-08-04

DNV GL local station: Rotterdam
Approval Engineer: Tom Berg-Nielsen

for DNV GL
Marianne Sparen Marveng
Head of Section

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# Completion of analysis on exploitation of recondensing equipment on LNG carriers

*Maksym Kulitsa and David A. Wood, FSRU and LNG consultants, present second part of report on key LNG transportation issue*

Potential benefits of installing recondenser equipment on LNG carriers (LNGC) and their operating patterns were covered in part one of this series for interested parties and tanker operators.

In this second section of the paper, we describe possible low-cost and more-comprehensive recondenser configurations for the vessels.

Firstly, there are alternative potential recondenser system configurations for LNGCs. So far, we have described what we consider to be the most cost-effective and efficient solution for minimizing GCU consumption on LNGC DFDE (or MEGI) type where engine room consumption is low leading to excess BOG for onboard handling.

## Varied

Here we consider other potential solutions that vary in their economic viability and efficiency.

Potential lower-investment solution, a customized spray-drum recondenser: The installation and use of patented equipment (such as branded recondensers) require a licence fee to be paid to the patent holder. For simple applications, we have developed a concept that leads to similar outcomes by constructing a customised spray-drum recondenser insulated drum, packed with BOG from the LDC to 3 to 4 barg with LNG fed to it from the cargo tanks and sprayed inside drum via "atomizing" nozzles.

The LNG spray feed line pressure would need to be about 4 to 5 barg to ensure fine-spray droplets of LNG within the condenser vessel. Spraying enlarges the heat and mass exchange area within the drum.

To further enlarge the condensing area, additional porous, inclined surfaces made of cryogenic-grade steel (a typical feature of conventional recondensers – "cold box" with cold LNG feed and spread directly into it) could be installed within the drum.

The principle of operation of this customized spray-drum recondenser is the same as conventional recondensers, i.e., sub-cooled LNG liquid absorbs the latent heat of condensation of the BOG and warmer liquid LNG emerges from the outflow.

## Distinct

It is distinct from traditional land-based or FSRU recondensers due to the fine-spraying of LNG within it, as it avoids the need for the space inside the recondenser to hold and store the warmer LNG produced within it.

The internal spray and "cold-box" (cold surface) configuration of the recondenser is considered to offer the most-efficient design as heat exchange is maximized with smaller space requirements. The level of warm LNG in the base of the recondenser drum can be low, but not zero.

A simple level-control valve, installed downstream of the recondenser, is required to control and maintain the low-liquid level in the base of the recondenser to ensure that only liquid-phase LNG is returned from it to the cargo tanks (Figure 5).

An LNG-inflow-control valve is not necessary in this configuration. This is because the amount of feed LNG should be the same or higher than that required to recondense the prevailing BOG, making the pressure and flow rate of the LNG feed easy to control with the stripping pumps' discharge valves. The system therefore requires only a simple manual isolation valve.

## Array

The BOG enters the recondenser through the base and passes through the condensate (warmer) LNG layer in its base to pre-cool the BOG. This optional arrangement for BOG entry into the recondenser (termed here the "economizer" arrangement) is an alternative to conventional top-entry for BOG to the recondenser, involving pre-cooling spray to BOG (prior to the BOG being released inside the recondenser drum) and requiring one additional LNG-flow-control valve.

The remainder of the pipework and pumping configuration for the spray-drum recondenser to operate on an LNGC is the same as for Figure 2, i.e., an array of stripping/spray pumps from each cargo tank supplies cooled LNG via the stripping/spray header, branched to feed LNG for spraying into the spray-drum recondenser.

The return line from the recondenser to the cargo tanks is the same configuration as Figure 2, beyond the level control valve.

There are two main condensing components to the spray-drum recondenser: 1) The spraying of cold injected LNG liquid, and, 2) the steel surface that is cooled by an additional entry point for cold distributed LNG, which serves as a condensing area for BOG ("cold box" with a manual valve to adjust the LNG inflow).

Balancing the effectiveness of those two condensing sites within the recondenser should lead to enhanced efficiency and a reduction in size compared to conventional recondensers. However, a single spray condensing component could be used (i.e., no cold box) to reduce the manufacturing cost of the spray-drum condenser.

Installation of a return LNG pump beyond the recondenser is not necessary as the pipework ends with the tank filling line (standard tank piping) entering the LNG cargo tank, and the warm LNG outflow from the recondenser (at 4 to 5 barg) will be inevitably pushed into the LNG return piping.

From that point, it will be forced further through the return pipework, by the continuous stream of liquid exiting the recondenser, to the bottom of the cargo tank where it will be dispersed. If any non-condensable gases are encountered, then an automatic pressure relief valve would return non-condensables back into nearest tank or vapour header.

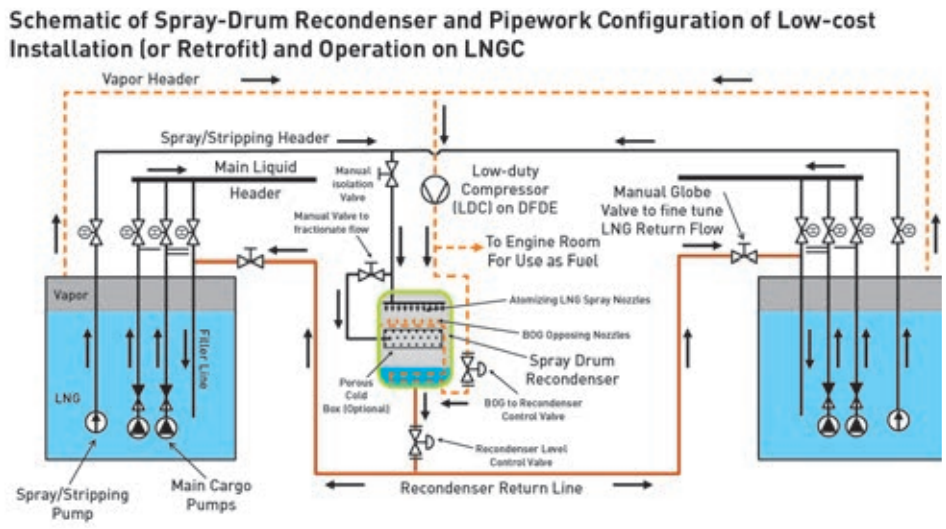


**Figure 5: A spray-drum recondenser arrangement for a DFDE LNGC. A "counter BOG-Spray flow with pre-cooling BOG ("economizer" and "cold box") is proposed, by the authors, to be the most efficient design concept, with the least cost investment and minimal size and space requirements for installation**

## Pipework

Alternatively, non-condensables could be passed directly into the LNG return line after a level control valve. Either arrangement would inevitably lead to non-condensables eventually being burned in engine room, sooner or later.

In the absence of detailed tests, it is impossible to compare the efficiencies of patented recondensers with the customized spray-drum recondenser described. The spray-drum recondenser is likely to occupy more space for the same reference flows than patented compact condensers.

A limit to high operating efficiency of the spray-drum recondenser is that the spray-stripping pumps can only deliver LNG at pressures of 5 to 6 barg, as the maximum working-condensing pressure within the drum could not exceed about 3 to 4 barg.

This upper pressure limitation would reduce the condensing capacity of the system, on the other hand, the spray-drum recondenser would only be required to process BOG flow up to a maximum of about 4 to 4.5 t/h (determined by NBOR

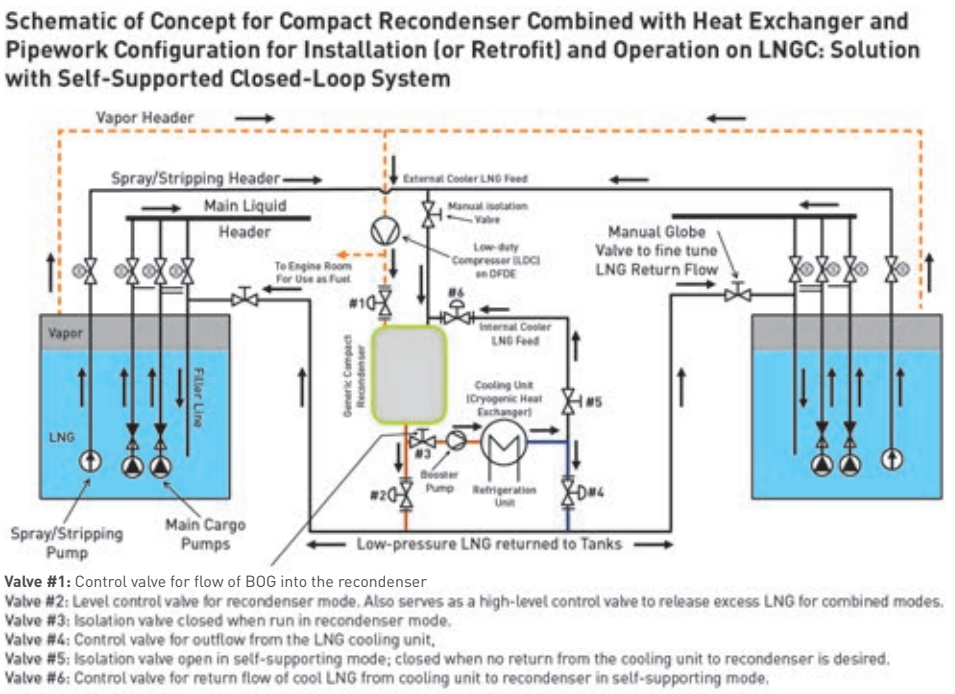


**Figure 6: Process flow schematic for concept recondenser unit combined with a cryogenic heat exchanger (e.g. Brayton cycle liquefaction system or mixed-refrigerant cycle) involving a booster pump to enable it to be operated as a stand-alone unit, as required**

of 0.15% vol/day), significantly lower than the 10 t/h for which patented compact recondensers are designed for.

## Efficiency

The efficiency of the spray-drum recondenser increase may be achieved by involving counter upward flow of BOG via nozzles against the downward flow of sprayed LNG within it.

Also, by configuring the BOG injection line to initially enter at the base of the spray-drum recondenser and pass through the basal layer of warm LNG liquid it can be pre-cooled by the BOG economizer configuration to further improve efficiency.

We consider the spray-drum recondenser configuration described to be potentially the cheapest recondenser installation and operating option for LNG DFDE.

We estimate the spray-drum size to be relatively small (subject to detailed design and engineering). The limitations on its use would be the same as those already described for conventional recondensers, i.e., temperature and SVP of the LNG in the cargo tanks causing tank pressure to reach the designated maximum-operating-pressure limits.

The advantage of such a configuration is that it is not sensitive to process-induced fluctuation of recondenser pressure on liquid level in the recondenser drum.

## Investment

Potential higher investment Solution, a BOG-spray recondenser system coupled with suitable additional cooling unit: Reliquefaction of BOG during a typical LNGC voyage at prevailing natural gas prices is not a commercially viable solution as running a reliquefaction plant involves significant fuel consumption, which can be more economically consumed as ship fuel in the engine room.

However, for large cargoes and long-distance voyages, such as those sometimes undertaken by Q-flex and Q-max vessels, recondensers can be commercially viable at modest natural gas prices. Also, for rare, non-standard voyages, such as those undertaken by LNGC with uncontracted full cargoes, subject to redirection or time spent moored offshore (many weeks in some cases) waiting for their cargoes to be sold, or storing cargoes for onward delivery, BOG losses (cargo loss) can be very large.

The two recondenser solutions discussed above will not be able to adequately address such BOG losses and we therefore propose a hybrid condenser-cooling heat exchanger option for consideration, that might provide a more viable and flexible option than installing a stand-alone reliquefaction unit.

The system described here is similar to the one proposed by Ryu et al. (2016) for handling BOG on LNG bunker refuelling vessels. Unlike the reliquefaction systems installed on Q-Flex-Q-Max LNGC (fitted with Wartsila reliquefaction units), this system, with at least two possible configurations (see Figures) initially liquefies BOG in a spray recondenser (i.e. any of the recondenser configurations described here) and then sub-cools the warm LNG outflow (or part of it) from the recondenser (extracting heat energy from the system).

It is better described as a combined recondenser-cooling unit or a spray-recondenser-reliquefaction unit.

A potentially efficient and flexible arrangement is to have a recondenser installed as a stand-alone unit, operating separately from a cooling unit (based on nitrogen-refrigerant cycle or a mixed-refrigerant cycle involving ethylene/propylene), but connected in series to it.

In that configuration, the recondenser could be operated independently (i.e., in recondenser mode, as already described), or as a combined system together with the cooling unit, when necessary (i.e., in recondenser-reliquefaction mode).

This two-independent-component solution assures optimal flexibility for handling a wide range of BOG situations on board LNGC, i.e., both short-term and long-term handling of excess BOG.

The incoming BOG, which is fed from a branch from the LDC discharge line at a pressure of 3 to 4 bar, enters the spray recondenser, which acts as a buffer tank against variations in the BOG load.

## Sources

Cooler LNG liquid may be provided from two sources: 1) the stripping pumps to provide external LNG feed from the cargo tanks, in case of high-BOG rates; 2) the branch of return flow of cooled LNG liquid from the cooling unit for spraying into the spray-drum recondenser, providing a closed self-supported loop for lower BOG rates.

The warm LNG (or part of it) exiting the spray recondenser is then pumped by booster pump to the cooling unit (heat exchanger that operates on a Brayton Nitrogen Cycle or a mixed-refrigerant cycle) for sub-cooling.

The cooled LNG outflow from the heat exchanger (cooling unit), in external-LNG-feed mode is directed back to the LNG cargo tanks, in the same manner as from recondenser, or into a single cargo tank (depending on the case).

In the arrangement with a booster pump the spraying of sub-cooled LNG recycled into the spray recondenser could, in certain conditions, be operated in a self-supported-closed-loop mode without feed of cool LNG from cargo tanks required.

However, it would require the stripping pump(s) in the cargo system to charge the system with LNG at the start of the recondenser operations.

## Complex

This system is quite complex and careful control adjustments would be required to assure stable operation in all modes of operation (e.g., external-LNG-feed mode and self-supported-closed-loop mode). These control adjustments would require various cross-linked and synchronized

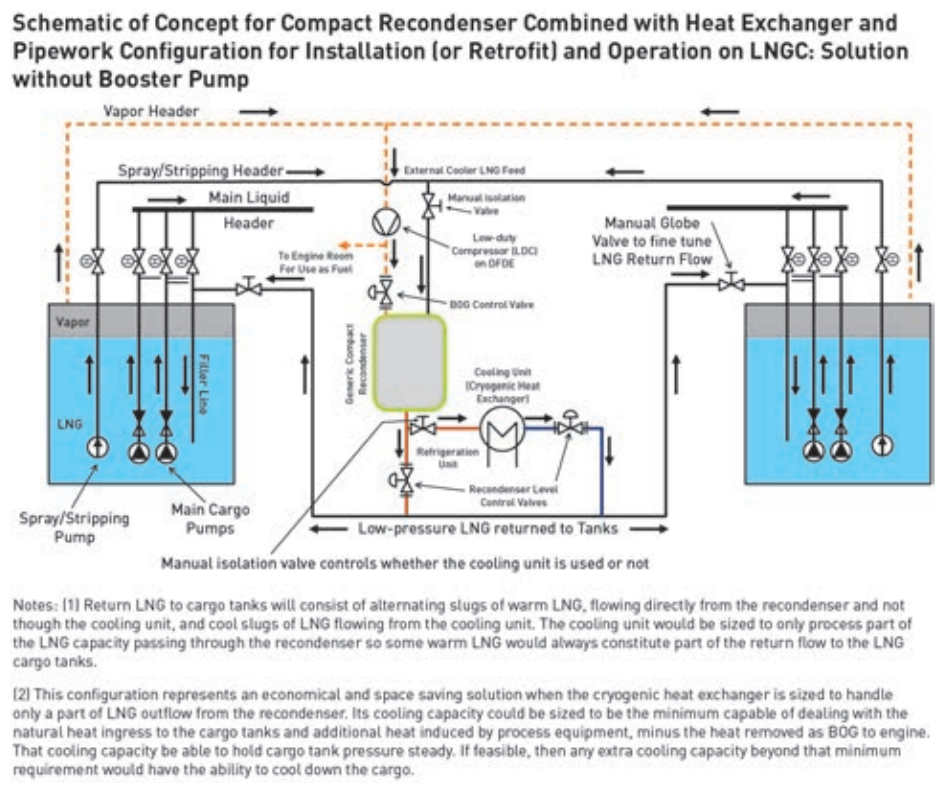


**Figure 7: Process flow schematic for concept recondenser unit combined with a cryogenic heat exchanger (e.g. Brayton cycle liquefaction system or mixed-refrigerant system) without a booster pump providing a simpler, but less flexible configuration. Cheapest combined recondenser-cooling-cycle solution for DFDE LNGC**

control valves in the configuration.

To reduce the complexity and equipment count of the refrigeration cycle, and the associated manufacturing and installation costs, a booster pump could be omitted (Figure 7).

This novel concept would reduce the flexibility of the system somewhat, as feed of cool LNG from the cargo tank would always be required for the system to operate.

That configuration would only require a second recondenser-level-control valve to be installed after the cooling unit, which would maintain the recondenser operating pressure and condensed LNG level in the drum.

The logic controls for the LNG-level-control valves should be arranged such that they may be operate independently (depending of mode), or in a cross-linked operation.

## Economical

It is considered that the most economical and efficient operating mode for this configuration would be in split-flow mode, i.e., when part of the LNG outflow from the recondenser is cooled and part of LNG is directed directly back to the LNG cargo tanks from the recondenser outflow.

In that operating mode, the refrigeration-heat exchanger design capacity could approach the theoretical minimum (if only cooled enough to hold tank pressure stable and, potentially, smaller capacity equipment could therefore be used).

This would be slightly above the capacity required to remove the process heat associated with the recondenser cycle, i.e., natural heat ingress to tanks minus heat removed by BOG sent to the engine room. The objective is to return the same total energy, or less, to the cargo tanks, compared to the energy removed from the cargo tanks in the form of BOG and LNG, and to completely remove natural heat ingress into tanks.

The equipment could be sized and adjusted for split-flow mode such that LNG liquid in the cargo tanks would not gain extra heat, as would be the case for a stand-alone recondenser operation. The higher heat removal of the split flow mode would make this configuration a potentially cheaper alternative to a reliquefaction unit.

## Simple cycle

The refrigeration (cryogenic heat exchanger) system (that is absent in a standard recondenser systems) could use various technologies, including a simple Brayton cycle consisting of nitrogen compression, precooling, and expansion.

In the system described by Ryu et al (2016) for an LNG bunker refuelling vessel the heat exchange cycle involves a nitrogen compander unit with a three-stage compressor and the dual expanders, but other configurations constituting a Brayton nitrogen cycle could be utilized. Wartsila shipboard reliquefaction units also use mixed-refrigerant systems.

Various LNG cooling systems (consisting of a refrigeration system, a heat exchanger, cooling medium and an appropriate flow configuration) could be used here, as long as they are able to provide the necessary degree of cooling LNG return flow to the cargo tanks on an economically feasible basis.

This combined recondenser-reliquefaction concept solution clearly requires more costly capital investments (compared to the simple recondenser systems already described) as it is necessary to install and connect a refrigerating unit to the recondenser.

Because such a system includes additional compressors and cascade systems, nitrogen for use as a refrigerant, it would involve additional operating and maintenance costs, including extra electric load to run all its associated equipment.

## Power

Pumping LNG using a stripping pump to feed a recondenser consumes little power, which is in contrast to the significant power required to compress the cooling medium (i.e., the refrigerant fluid) for use in the refrigeration unit.

Installation would also take up space in the cargo machinery room or a separate dedicated deckhouse, while the previous solutions describe would easily fit on to a LNGC's open deck or existing cargo machinery room.

The potential advantage of such a solution is the possibility to run it continuously, which would prevent temperature rise in the LNG cargo tanks (or cool LNG in the cargo tanks if refrigeration capacity is excessive), and effectively avoid GCU consumption. Also, the option remains to run just the recondenser unit, without engaging cooling unit, to deal with short-term excess BOG cases.

As mentioned, it might be cost-effective and environmentally appropriate for those LNGC engaged in atypical voyages with long standby periods fully loaded.

However, because the operating patterns of most long-haul LNGC require GCU operations only intermittently for short periods, the total benefits (reduction of gas losses and atmospheric emissions) versus installation and operating and maintenance costs would require careful evaluation and may be difficult in typical LNGC operations to justify on a commercial basis.

This solution is more expensive for steam-powered ships compared to DFDE due to the requirement to install additional LDC or similar equipment.

## Conclusions

The installation of a recondenser to condense BOG and recirculate it to the cargo tanks of DFDE LNGC has the potential to save valuable cargo from being lost through consumption in the GCU and similar equipment, or, at least, to reduce the amount of time that equipment needs to be run.

Running a recondenser in such a way is within the safe operating limits of all existing LNGC and does not require complicated modifications and installations. DFDE LNGC with higher NBOR are likely to be the vessels most interested in such solutions, but newer LNGC with low NBOR (e.g., GTT Mark V) may also increase its performance with respect to excess BOG if such equipment is installed.

Application of the proposed measures in specific circumstances during the laden voyage improves DFDE LNGC performance by reducing shipboard gas consumption, thereby optimizing returns to the charterers-customers by providing them with more gas to sell.

For steam-powered LNGC the installation of recondenser equipment also offers a potentially attractive solution, but it requires the additional installation of a dedicated, high-pressure compressor (similar to that installed on DFDE LNGC).

Three different potential configurations involving a recondenser system placed on a LNGC for such purposes are developed and described by authors. These have different equipment and cost requirements that need to be further evaluated together with detailed comparisons of process simulations for each option. Currently, the most cost-effective solution for the DFDE LNGC following typical cargo transportation practices and STS cargo transfers (i.e., not spending significant time anchored with a full cargo waiting to offload it or seek a buyer for an unsold cargo) is likely to be a single recondenser that recirculates LNG from spray pumps, condenses BOG and returns it back to the cargo tanks without any additional cooling (i.e., a short-term solution).

Taking into account the typical operating pattern of LNGC, the available condenser operating time (that delays the use of the GCU) should be sufficient to cancel or significantly reduce GCU consumptions in most operating scenarios. For vessels which are frequently handling uncontracted cargoes and subject to redirection while at sea and/or significant standby time at anchor outside ports awaiting commercial transactions, it may be possible to commercially justify hybrid condenser-heat exchanger (cooler unit) or complete reliquefaction units, as alternatives to simple condenser solutions.

However, the commercial viability of such options will depend heavily on prevailing natural gas prices and the relative prices of natural gas and diesel as engine fuels. ■

## About the Authors

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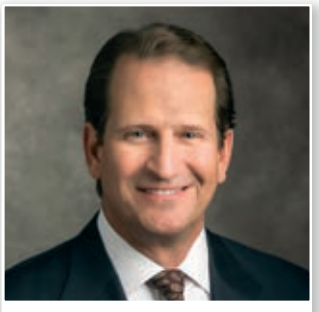

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# World LNG Carrier Fleet

| LNG carrier | Capacity $m^3$ | Owned or Ordered by | Builder | Delivery Date | Flag | Power Plant | Cargo System | No. of tanks | Ship built for Export plant |
|---|---|---|---|---|---|---|---|---|---|
| Aamira | 266,000 | QGTC | Samsung | Dec-10 | Liberia | DRL | TZ Mk. III | 5 | Qatargas IV |
| Abadi | 135,000 | Brunei Gas Carriers | Mitsubishi Nagasaki | Jun-02 | Brunei | S | Moss | 5 | Brunei LNG |
| Abalamabie | 174,900 | Bonny Gas | Samsung | June-16 | Bermuda | DFDE | TZ Mk III | 4 | Nigeria LNG |
| Adam LNG | 162,000 | Oman LNG | Hyundai | Dec-14 | Marshall Is. | DFDE | TZ Mk. III | 4 | Oman LNG |
| Al Aamriya | 210,100 | J5 Consortium | Daewoo | Feb-08 | Marshall Is. | DRL | GT NO 96 | 4 | Qatargas |
| Al Areesh | 151,700 | Teekay LNG | Daewoo | Jan-07 | Qatar | S | GT NO 96 | 4 | Ras Gas II |
| Al Bahiya | 266,000 | QGTC | Samsung | Oct-09 | Liberia | DRL | TZ Mk. III | 5 | Qatar-Atlantic |
| Al Biddah | 135,275 | J4 Consortium | Kawasaki Sakaide | Nov-99 | Japan | S | Moss | 5 | Qatargas |
| Al Daayen | 151,700 | Teekay LNG | Daewoo | Apr-07 | Qatar | S | GT NO 96 | 4 | RasGas II |
| Al Dafna | 266,000 | QGTC | Samsung | Oct-09 | Marshall Is. | LR DRL | GT NO 96 | 4 | Qatar-Atlantic |
| Al Deebel | 145,000 | Peninsular LNG | Samsung | Dec-05 | Bahamas | S | TZ Mk. III | 4 | Qatargas |
| Al Gattara | 216,200 | OSG/Nakilat | Hyundai | Oct-07 | Marshall Is. | DRL | TZ Mk. III | 4 | Qatargas II |
| Al Ghariya | 210,100 | ProNav | Daewoo | Feb-08 | Bahamas | DRL | GT No. 96 | 4 | Qatargas |
| Al Gharaffa | 216,200 | OSG/Nakilat | Hyundai | Jan-08 | Marshall Is. | DRL | TZ Mk. III | 4 | Various |
| Al Ghashamiya | 216,000 | QGTC | Samsung | Mar-09 | Liberia | DRL | TZ Mk. III | 4 | Qatar-Atlantic Basin |
| Al Ghuwairiya | 261,700 | QGTC | Daewoo | Aug-08 | Marshall Is. | DRL | GT NO. 96 | 5 | Qatar-Atl'c Basin |
| Al Hamla | 216,000 | OSG | Samsung | Feb-08 | Marshall Is. | DRL | TZ Mk. III | 4 | QatarGas |
| Al Hamra | 137,000 | National Gas Shipping | Kvaerner-Masa | Jan-97 | Liberia | S | Moss | 4 | ADGAS |
| Al Huwaila | 217,000 | Teekay | Samsung | May-08 | Bahamas | DRL | TZ Mk. III | 4 | RasGas III |
| Al Jasra | 137,100 | J4 Consortium | Mitsubishi Nagasaki | Jul-00 | Japan | S | Moss | 5 | Qatargas |
| Al Jassasiya | 145,700 | Maran-Nakilat | Daewoo | May-07 | Greece | S | GT No 96 | 4 | RasGas |
| Al Kharaitiyat | 216,200 | QGTC | Hyundai | May-09 | Liberia | DRL | TZ Mk. III | 4 | Qatargas III |
| Al Kharaana | 210,000 | QGTC | Daewoo | Oct-09 | Marshall Is. | DRL | GT NO 96 | 4 | Qatargas IV |
| Al Kharsaah | 217,000 | Teekay | Samsung | May-08 | Bahamas | DRL | TZ Mk. III | 4 | RasGas III |
| Al Khattiya | 210,000 | QGTC | DSME | Oct-09 | Marshall Is. | DRL | GT No. 96 | 4 | Qatargas IV |
| Al Khaznah | 135,500 | National Gas Shipping | Mitsui Chiba | Jun-94 | Liberia | S | Moss | 5 | ADGAS |
| Al Khor | 137,350 | J4 Consortium | Mitsubishi Nagasaki | Dec-96 | Japan | S | Moss | 5 | Qatargas |
| Al Khuwair | 217,000 | Teekay LNG | Samsung | Jul-08 | Korea | DRL | TZ Mk. III | 4 | RasGas |
| Al Mafyar | 266,000 | OSG/Nakilat | Hyundai | Oct-07 | Marshall Is. | DRL | TZ Mk. III | 4 | Qatargas II |
| Al Marrouna | 151,700 | Teekay | Daewoo | Nov-07 | Bahamas | S | GT NO 96 | | Ras Gas I |
| Al Mayeda | 266,000 | QGTC | Samsung | Jan-09 | Liberia | DRL | TZ Mk. III | 5 | Qatar-US/Var. |
| Al Nuaman | 210,000 | QGTC | DSME | Dec-09 | Marshall Is. | DRL | GT No. 96 | 4 | Qatargas IV |
| Al Oraiq | 210,000 | J5 Consortium | Daewoo | Apr-08 | Marshall Is. | DRL | GT No. 96 | 4 | Various |
| Al Rayyan | 135,360 | J4 Consortium | Kawasaki Sakaide | Mar-97 | Japan | S | Moss | 5 | Qatargas |
| Al Rekayyat | 216,200 | QGTC | Hyundai | Jun-09 | Bahamas | DRL | TZ Mk.III | 4 | Qatar-Atlantic |
| Al Ruwais | 210,100 | ProNav | Daewoo | Nov-07 | Germany | DRL | GT NO 96 | 4 | Qatargas II |
| Al Sadd | 210,100 | QGTC | Daewoo | Mar-09 | Liberia | DRL | GT NO 96 | 4 | Qatar-Atlantic Basin |
| Al Safliya | 210,100 | ProNav | Daewoo | Dec-07 | Bahamas | DRL | GT NO 96 | 4 | Qatargas II |
| Al Sahla | 216,200 | J5 | Hyundai | Jun-08 | Japan | DRL | TZ Mk. III | 4 | Ras Gas III |
| Al Samriya | 261,700 | QGTC | Daewoo | Sep-08 | Marshall Is. | DRL | GT NO. 96 | 5 | Qatargas II |
| Al Sheehaniya | 210,100 | QGTC | Daewoo | Feb-09 | Liberia | DRL | GT NO 96 | 4 | Qatar-Atlantic Basin |
| Al Shamal | 217,000 | Teekay LNG | Samsung | Jun-08 | Qatar | DRL | TZ Mk. III | 4 | RasGas |
| Al Thakhira | 145,000 | Peninsular LNG | Samsung | Sep-05 | Bahamas | S | TZ Mk. III | 4 | Qatargas |
| Al Thumama | 216,000 | J5 Consortium | Hyundai | Apr-08 | Japan | DRL | TZ Mk. III | 4 | Rasgas |
| Al Utouriya | 215,000 | J5 | Hyundai | Sep-08 | Panama | DRL | TZ Mk. III | 4 | RasGas |
| Al Utourma | 215,000 | J5 | Hyundai | Sep-08 | Panama | DRL | TZ Mk. III | 4 | Ras Gas III |
| Al Wajbah | 137,350 | J4 Consortium | Mitsubishi Nagasaki | Jun-97 | Japan | S | Moss | 5 | Qatargas |
| Al Wakrah | 135,360 | J4 Consortium | Kawasaki Sakaide | Dec-98 | Japan | S | Moss | 5 | Qatargas |
| Al Zhubarah | 137,570 | J4 Consortium | Mitsui Chiba | Dec-96 | Japan | S | Moss | 5 | Qatargas |
| Alto Acrux | 147,000 | LNG Marine Transport | Mitsubishi | Mar-08 | Bahamas | S | Moss | 4 | Various |
| Amali | 148,000 | Brunei-Shell | DSME | Jul-11 | Brunei | DFDE | GT No. 96 | 4 | Brunei LNG |
| Amanl | 154,800 | Brunei-Shell | Hyundai | Nov-14 | Brunei | DFDE | TZ Mk. III | 4 | Brunei LNG |
| Aman Bintulu | 18,928 | Perbadanan / NYK Line | NKK Tsu | Oct-93 | Malaysia | S | TZ Mk. III | 3 | Petronas |
| Aman Hakata | 18,800 | Perbadanan / NYK Line | NKK Tsu | Nov-98 | Malaysia | S | TZ Mk. III | 3 | Petronas |
| Aman Sendai | 18,928 | Perbadanan / NYK Line | NKK Tsu | May-97 | Malaysia | S | TZ Mk. III | 3 | Petronas |
| Arctic Aurora | 160,000 | Dynagas | Hyundai | Jul-13 | Marshall Is. | DFDE | TZ Mk. III | 4 | Various |
| Arctic Discoverer | 140,000 | K Line | Mitsui Chiba | Jan-06 | Bahamas | S | Moss | 4 | Various |
| Arctic Lady | 147,200 | MOL/Hoegh LNG | Mitsubishi Nagasaki | Apr-86 | Norway | S | Moss | 4 | Various |
| Arctic Princess | 147,200 | MOL/Hoegh LNG | Mitsubishi Nagasaki | Jan-06 | Norway | S | Moss | 4 | Various |
| Arctic Sun | 89,880 | Arctic LNG Shipping | IHI Chita | Dec-93 | Liberia | S | IHI SPB | 4 | ConocoPhillips/Marathon |
| Arctic Voyager | 140,000 | K Line | Kawasaki | Jul-06 | Bahamas | S | Moss | 4 | Statoil |
| Arkat | 148,000 | Brunei-Shell | DSME | Feb-11 | Brunei | DFDE | GT. No. 96 | 4 | Brunei LNG |
| Arwa Spirit | 165,000 | Teekay LNG | Samsung | Sep-08 | Marshall Is. | DFDE | TZ Mk. III | 4 | Various |
| Aseem | 154,850 | K Line-Petronet | Samsung | Nov-09 | Malta | S | GT No 96 | 4 | Qatar-India |
| Asia Endeavour | 160,000 | Chevron | Samsung | Dec-14 | Bahamas | DFDE | TZ Mk. III | 4 | Various |
| Asia Energy | 160,000 | Chevron | Samsung | Sept-14 | Bahamas | DFDE | TZ Mk. III | 4 | Various |
| Asia Excellence | 160,000 | Chevron | Samsung | Sept-13 | Bahamas | DFDE | TZ Mk. III | 4 | Various |
| Asia Venture | 160,000 | Chevron | Samsung | Sept-17 | Bahamas | DFDE | TZ Mk. III | 4 | Various |
| Asia Vision | 160,000 | Chevron | Samsung | June-14 | Bahamas | DFDE | TZ Mk. III | 4 | Various |
| Barcelona Knutsen | 173,400 | Knutsen | Daewoo | May-10 | N.I.S. | DFDE | GT NO 96 | 4 | Various |
| Bebatic | 75,060 | Brunei Shell Tankers | Atlantique | Oct-72 | Brunei | S | TZ Mk. I | 6 | Brunei LNG |
| Beidou Star | 172,000 | MOL | Hudong | Oct-15 | Hong Kong | DRL | GT NO. 96 | 4 | Various |
| Berge Arzew | 138,088 | BW Gas | Daewoo | Jul-04 | Norway | S | GT NO 96 | 4 | Sonatrach |
| Boris Vilkitsky | 172,000 | Dynagas | Daewoo | Oct-17 | Cyprus | DFDE | GT No. 96 | 4 | Various |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| BW GDF-Suez Boston | 138,059 | BW Gas | Daewoo | Jan-03 | Norway | S | GT NO 96 | 4 | Suez LN |
| BW GDF Suez Everett | 138,028 | BW Gas | Daewoo | Jun-03 | Norway | S | GT NO 96 | 4 | Suez LNG |
| BW Integrity | 170,000 | BW Gas | Samsung | May-17 | Singapore | DFDE | TZ Mk. III | 4 | FSRU |
| BW Pavilion Leeara | 161,880 | BW Gas | Hyundai | Feb-15 | Singapore | DFDE | TZ Mk. III | 4 | Various |
| BW Pavilion Vanda | 161,880 | BW Gas | Hyundai | Feb-15 | Singapore | DFDE | TZ Mk. III | 4 | Various |
| BW Singapore | 170 000 | BW Gas | Samsung | May-15 | Singapore | DFDE | TZ Mk. III | 4 | FSRU |
| BW Suez Paris | 162,400 | BW Gas | Daewoo | May-09 | N.I.S. | DFDE | GT NO 96 | 4 | Yemen-Atlantic |
| Bilbao Knutsen | 138,000 | Knutsen / Marpetrol | IZAR Sestao | Jan-04 | Spain | S | GT NO 96 | 4 | Atlantic LNG |
| Bilis | 77,730 | Brunei Shell Tankers | La Seyne | Mar-75 | Brunei | S | GT NO 82 | 5 | Brunei LNG |
| Bishu Maru | 162,000 | K Line-Transpacific | Kawasaki Sakaide | Dec-15 | Panama | S | Moss | 4 | Australia-Japan |
| British Diamond | 155,000 | BP Shipping | Hyundai | Sep-08 | IOM | DFDE | TZ Mk. II | 4 | Indonesia-Various |
| British Emerald | 155,000 | BP Shipping | Hyundai | Jun-07 | UK | DFDE | TZ Mk. III | 4 | Tangguh LNG |
| British Innovator | 138,200 | BP Shipping | Samsung | Jul-03 | Isle of Man | S | TZ Mk. III | 4 | Various |
| British Merchant | 138,000 | BP Shipping | Samsung | Apr-03 | Isle of Man | S | TZ Mk. III | 4 | Various |
| British Ruby | 155,000 | BP Shipping | Hyundai | Jan-08 | U.K. | DFDE | TZ Mk. III | 4 | Various |
| British Sapphire | 155,000 | BP Shipping | Hyundai | Sep-08 | IOM | DFDE | TZ Mk. III | 4 | Tangguh |
| British Trader | 138,000 | BP Shipping | Samsung | Dec-02 | Isle of Man | S | TZ Mk. III | 4 | Engas |
| Broog | 135,466 | J4 Consortium | Mitsui Chiba | May-98 | Japan | S | Moss | 5 | Qatargas |
| Bu Samara | 266,000 | QGTC | Samsung | Dec-08 | Qatar | DRL | TZ Mk. III | 5 | Qatargas |
| BW Suez Paris | 162,400 | BW Gas | Daewoo | May-09 | N.I.S. | DFDE | GT NO 96 | 4 | Yemen-Atlantic |
| BW Suez Brussels | 162,400 | BW Gas | Daewoo | May-09 | N.I.S. | DFDE | GT NO 96 | 4 | Yemen-Atlantic |
| Cadiz Knutsen | 138,826 | Knutsen / Marpetrol | IZAR Puerto Real | Jun-04 | Spain | S | GT NO 96 | 4 | Engas |
| Castillo de Santisteban | 173,600 | Elcano | STX | Aug-10 | Malta | S | GT NO. 96 | | Various |
| Castillo de Villalba | 138,000 | Elcano | IZAR | Nov-03 | Spain | S | GT NO 96 | 4 | Sonatrach |
| Catalunya Spirit | 138,000 | Teekay LNG Partners | IZAR Sestao | Mar-03 | Liberia | S | GT NO 96 | 4 | Atlantic LNG |
| Celestine River | 145,000 | KLNG | Kawasaki | Dec-07 | Bahamas | S | Moss | | Various |
| Cesi Beihai | 174,100 | MOL-China LNG | Hudong | June-17 | Hong Kong | S | GT No 96 | 4 | Australia-China |
| Cesi Gladstone | 174,100 | MOL-China LNG | Hudong | Oct-16 | Hong Kong | S | GT No 96 | 4 | Australia-China |
| Cesi Qingdao | 174,100 | MOL-China LNG | Hudong | Nov-16 | Hong Kong | S | GT No 96 | 4 | Australia-China |
| Cesi Tianjin | 174,100 | MOL-China LNG | Hudong | Sept-17 | Hong Kong | S | GT No 96 | 4 | Australia-China |
| Challenger FSRU | 263,000 | MOL LNG | Daewoo | Oct-17 | St Kitts | DFDE | GT No. 96 | 4 | Various |
| Cheikh Bouamama | 75,500 | Skikda LNG Transport | USC | Jul-08 | Bahamas | S | TZ Mk. III | 4 | Sonatrach |
| Cheikh El Mokrani | 75,500 | Med LNG Corp | USC | Jun-07 | Bahamas | S | TZ Mk. III | 4 | Sonatrach |
| Christophe de Margerie | 172,600 | SCF | Daewoo | Nov-16 | Cyprus | DFDE | GT NO 96 | 4 | Various |
| Clean Energy | 150,000 | Dynagas | Hyundai | Mar-07 | Marshall Is. | S | TZ Mk. III | 4 | Various |
| Clean Force | 150,000 | Dynagas | Hyundai | Jan-08 | Marshall Is. | S | TZ Mk. III | 4 | Various |
| Clean Ocean | 155,900 | Dynagas | Hyundai | Mar-14 | Marshall Is. | DFDE | TZ Mk. III | 4 | Various |
| Clean Planet | 155,900 | Dynagas | Hyundai | Mar-14 | Marshall Is. | DFDE | TZ Mk. III | 4 | Various |
| Clean Vision | 160,000 | Dynagas | Hyundai | Jun-15 | Marshall Is. | DFDE | TZ Mk. III | 4 | Various |
| Cool Explorer | 160,000 | Thenamaris | Samsung | Oct-13 | Bermuda | DFDE | TZ Mk. III | 4 | Various |
| Cool Runner | 160,000 | Thenamaris | Samsung | May-14 | Bermuda | DFDE | TZ Mk. III | 4 | Various |
| Cool Voyager | 160,000 | Thenamaris | Samsung | Oct-13 | Bermuda | DFDE | TZ Mk. III | 4 | Various |
| Corcovado LNG | 160,106 | TMSC Gas | Daewoo | Jun-14 | Malta | TFDE | GT No 96 | 4 | Various |
| Creole Spirit | 174,000 | Teekay | Daewoo | Jan-16 | Bahamas | MEGI-DF | NO. 96 GW | 4 | Cheniere |
| Cubal | 160,400 | Mitsui/NYK/Teekay | Samsung | Jan-12 | Bahamas | DFDE | TZ Mk. III | 4 | Various |
| Cygnus Passage | 145,400 | Cygnus LNG | Mitsubishi | Feb-09 | Panama | S | Moss | 4 | Various |
| Dapeng Moon | 147,000 | China Ships | Hudong | Jul-09 | China | S | GT NO 96 | 4 | Various |
| Dapeng Star | 147,000 | China Ships | Hudong | Nov-09 | China | S | GT NO 96 | 4 | Various |
| Dapeng Sun | 147,000 | China Ships | Hudong | Jul-07 | China | S | GT NO 96 | 4 | Woodside Energy |
| Disha | 136,000 | Petronet LNG Ltd. | Daewoo | Jan-04 | Malta | S | GT NO 96 | 4 | Qatargas |
| Doha | 137,350 | J4 Consortium | Mitsubishi Nagasaki | Jun-99 | Japan | S | Moss | 5 | Qatargas |
| Duhail | 210,100 | ProNav | Daewoo | Jan-08 | Germany | DRL | GT NO 96 | 4 | Various |
| Dukhan | 135,000 | J4 Consortium | Mitsui Chiba | Oct-04 | Japan | S | Moss | 4 | Qatargas |
| Dwiputra | 127,385 | Humpuss Consortium | Mitsubishi Nagasaki | Mar-94 | Bahamas | S | Moss | 4 | Pertamina |
| Ebisu | 147,547 | Golar LNG | Kawasaki | Sep-08 | Bahamas | S | Moss | 4 | Various |
| Eduard Toll | 172,000 | Teekay-CLNG | Daewoo | Dec-17 | Bahamas | MEGI-DF | GT No. 96 | 4 | Various |
| Ejnan | 145,000 | 4J | Samsung | Jan-07 | Bahamas | S | TZ Mk. III | | RasGas |
| Ekaputra | 136,400 | Humpuss Consortium | Mitsubishi Nagasaki | Jan-90 | Liberia | S | Moss | 5 | Pertamina |
| Energy Advance | 145,000 | Tokyo LNG Tankers | Kawasaki Sakaide | Mar-05 | Japan | S | Moss | 4 | Darwin |
| Energy Atlantic | 159,924 | Alpha | STX Jinhae | Sep-15 | Malta | DFDE | No. 96 | 4 | Various |
| Energy Confidence | 155,000 | Tokyo LNG Tankers | Kawasaki | Apr-09 | Panama | S | Moss | 4 | Various |
| Energy Frontier | 147,600 | Tokyo LNG Tankers | Kawasaki Sakaide | Sep-03 | Japan | S | Moss | 4 | Darwin |
| Energy Horizon | 177,000 | Tokyo LNG Tankers | Kawasaki | Jul-11 | Japan | S | Moss | 4 | Pluto LNG |
| Energy Navigator | 147,000 | Tokyo LNG Tankers | Kawasaki Sakaide | May-08 | Japan | S | Moss | 4 | Various |
| Energy Progress | 145,000 | MOL | Kawasaki | Nov-06 | Japan | S | Moss | 4 | Bayu Undan LNG |
| Esshu Maru | 162,000 | K Line-Transpacific | Kawasaki Sakaide | Dec-14 | Panama | S | Moss | 4 | Australia-Japan |
| Excalibur | 138,200 | Exmar/ Excelerate | Daewoo | Oct-02 | Belgium | S | GT NO 96 | 4 | Various |
| Excel | 138,106 | Exmar/ MOL | Daewoo | Sep-03 | Belgium | S | GT NO 96 | 4 | Various |
| Excelerate | 138,000 | Exmar/Excelerate | Daewoo | Oct-06 | Belgium | S | GT NO 96 | 4 | Various |
| Excellence | 138,000 | GKFF Ltd. | Daewoo | May-05 | Belgium | S | GT NO 96 | 4 | Excelerate Energy |
| Excelsior | 138,000 | Exmar | Daewoo | Jan-05 | Belgium | S | GT NO 96 | 4 | Various |
| Exemplar | 150,900 | Excelerate | Daewoo | Jun-10 | Belgium | S | GT NO 96 | 4 | Various |
| Expedient | 151,000 | Excelerate | Daewoo | Nov-09 | Belgium | S | GT NO 96 | 4 | Various |
| Experience RV | 174,000 | Exmar/Excelerate | Daewoo | Jul-14 | Marshall Is. | DFDE | GT NO 96 | | Various |
| Explorer | 150,900 | Exmar/Excelerate | Daewoo | Mar-08 | Belgium | S | GT NO 96 | 4 | Excelerate |
| Express | 151,000 | Exmar/Excelerate | Daewoo | May-09 | Belgium | S | GT NO 96 | 4 | Various |
| Exquisite | 150,900 | Excelerate | Daewoo | Sep-09 | Belgium | S | GT NO 96 | 4 | Various |
| Fedor Litke | 172,636 | Dynagas | Daewoo | Nov-17 | Cyprus | DFDE | GT No. 96 | 4 | Various |
| Flex Endeavour | 173,400 | Flex LNG | Daewoo | Jan-18 | Marshall Is. | MEGI-DF | NO. 96 GW | 4 | Various |
| Flex Enterprise | 173,400 | Flex LNG | Daewoo | Jan-18 | Marshall Is. | MEGI-DF | NO. 96 GW | 4 | Various |

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| Fraiha | 210,100 | J5 Consortium | Daewoo | Sep-08 | Marshall Is. | DRL | GT NO 96 | 4 | Qatargas |
| FSRU Independence | 170,000 | Hoegh | Hyundai | Feb-14 | NIS | DFDE | TZ Mk. III | 4 | Various |
| FSRU Lampung | 170,000 | Hoegh | Hyundai | May-14 | Indonesia | DFDE | TZ Mk. III | 4 | Various |
| Fuji LNG | 147,895 | TMSC Gas | Kawasaki | Jun-04 | Malta | S | Moss | 4 | Various |
| Fuwairit | 138,000 | Peninsular LNG | Samsung | Jan-04 | Bahamas | S | TZ Mk. III | 4 | RasGas II |
| Galea | 134,425 | Shell Shipping | Mitsubishi Nagasaki | Oct-02 | Singapore | S | Moss | 5 | Shell |
| Galicia Spirit | 140,620 | Teekay LNG Partners | Daewoo | Jul-04 | Liberia | S | GT NO 96 | 4 | Engas |
| Gaselys | 153,500 | GdF/NYK | Atlantique | Mar-07 | France | DFDE | CS 1 | 4 | Engas |
| Gallina | 134,425 | Shell Shipping | Mitsubishi Nagasaki | Oct-02 | Singapore | S | Moss | 5 | Shell |
| GasLog Chelsea | 153,000 | GasLog | Hanjin Korea | Dec-09 | Panama | TFDE | TZ Mk. III | 4 | Various |
| Gaslog Geneva | 174,000 | GasLog | Samsung | Sept-16 | Bermuda | TFDE | TZ Mk. III | 4 | Shell charter |
| Gaslog Gibraltar | 174,000 | GasLog | Samsung | Oct-16 | Bermuda | TFDE | TZ Mk. III | 4 | Shell charter |
| Gaslog Glasgow | 174,000 | GasLog | Samsung | Jun-16 | Bermuda | TFDE | TZ Mk. III | 4 | Shell charter |
| Gaslog Greece | 174,000 | GasLog | Samsung | Mar-16 | Bermuda | TFDE | TZ Mk. III | 4 | Shell charter |
| GasLog Salem | 165,000 | GasLog | Samsung | Apr-15 | Liberia | TFDE | TZ Mk. III | 4 | Various |
| GasLog Santiago | 155,000 | GasLog | Samsung | Mar-13 | Liberia | TFDE | TZ Mk. III | 4 | Various |
| GasLog Saratoga | 155,000 | GasLog | Samsung | Dec-14 | Bermuda | TFDE | TZ Mk. III | 4 | Various |
| Gaslog Savannah | 155,000 | GasLog | Samsung | May-10 | Bermuda | DFDE | TZ Mk. III | 4 | Various |
| GasLog Seattle | 155,000 | GasLog | Samsung | Oct-13 | Bermuda | TFDE | TZ Mk. III | 4 | Various |
| GasLog Shanghai | 155,000 | GasLog | Samsung | Jan-13 | Liberia | TFDE | TZ Mk. III | 4 | Various |
| Gaslog Singapore | 155,000 | GasLog | Samsung | Jul-10 | Bermuda | DFDE | TZ Mk. III | 4 | Various |
| Gaslog Skagen | 155,000 | GasLog | Samsung | Oct-13 | Bermuda | DFDE | TZ Mk. III | 4 | Various |
| Gaslog Sydney | 155,000 | GasLog | Samsung | May-13 | Bermuda | DFDE | TZ Mk. III | 4 | Various |
| GDF-Suez Global Energy | 74,000 | Gaz de France | Chantiers | Dec-06 | France | DFDE | CS1 | 4 | Sonatrach |
| GDF-Suez Cape Ann | 145,000 | Hoegh LNG/MOL | Samsung | May-10 | Liberia | DFDE | TZ Mk. III | 4 | Various |
| GDF-Suez Neptune | 145,000 | Hoegh LNG/MOL | Samsung | Dec-09 | Liberia | DFDE | TZ Mk. III | 4 | Various |
| GDF-Suez Point Fortin | 154,200 | LNG Japan | Imabari/Koyo | Feb-10 | Panama | DFDE | TZ Mk. III | 4 | Various |
| Gemmata | 138,100 | Shell Shipping | Mitsubishi Nagasaki | Mar-04 | Singapore | S | Moss | 5 | Shell |
| Ghasha | 137,510 | National Gas Shipping | Mitsui | Jun-95 | Liberia | S | Moss | 5 | ADGAS |
| Gigira Laitebo | 177,000 | MOL-Itochu | Hyundai | Feb-09 | Panama | DFDE | TZ Mk. III | 4 | Various |
| Golar Arctic | 140,645 | Golar LNG | Daewoo | Dec-03 | Marshall Is. | S | GT NO 96 | 4 | Shell Spot |
| Golar Bear | 160,000 | Golar | Samsung | Mar-14 | Bermuda | DFDE | TZ Mk. III | 4 | Various |
| Golar Celsius | 160,000 | Golar LNG | Samsung | Sep-13 | Bermuda | DFDE | TZ Mk. III | 4 | Various |
| Golar Crystal | 160,000 | Golar LNG | Samsung | Oct-13 | Bermuda | DFDE | TZ Mk. III | 4 | Various |
| Golar Eskimo (FSRU) | 160,000 | Golar LNG | Samsung | Jan-15 | Bermuda | DFDE | TZ Mk. III | 4 | Various |
| Golar Freeze | 125,850 | Golar LNG | HDW | Feb-77 | UK | S | Moss | 5 | Various |
| Golar Glacier | 162,000 | Golar LNG | Hyundai | Sep-14 | Marshall Is. | DFDE | TZ Mk. III | 4 | Various |
| Golar Grand | 145,880 | Golar LNG | Daewoo | 2006 | IoM | | GT NO 96 | 4 | Various |
| Golar Ice | 160,000 | Golar LNG | Samsung | Feb-15 | Bermuda | DFDE | TZ Mk. III | 4 | Various |
| Golar Igloo (FSRU) | 160,000 | Golar LNG | Samsung | Oct-13 | Bermuda | DFDE | TZ Mk. III | 4 | Various |
| Golar Kelvin | 160,000 | Golar LNG | Samsung | Jan-15 | Bermuda | DFDE | TZ Mk. III | 4 | Various |
| Golar Maria | 145,950 | Golar LNG | Daewoo | 2006 | Marshall Is. | | GT NO 96 | 4 | Various |
| Golar Mazo | 135,225 | Golar LNG/CPP | Mitsubishi | Jan-00 | Liberia | S | Moss | 5 | Pertamina |
| Golar Penguin | 160,000 | Golar LNG | Samsung | Mar-14 | Marshall Is. | DFDE | TZ Mk. III | 4 | Various |
| Golar Seal | 160,000 | Golar LNG | Samsung | Aug-13 | Bermuda | DFDE | TZ Mk. III | 4 | Various |
| Golar Singapore (FSRU) | 160,000 | Golar LNG | Samsung | June-15 | Bermuda | DFDE | TZ Mk. III | 4 | Various |
| Golar Snow | 160,000 | Golar LNG | Samsung | Jan-15 | Bermuda | DFDE | TZ Mk. III | 4 | Various |
| Golar Tundra (FSRU) | 160,000 | Golar LNG | Samsung | Dec-15 | Bermuda | DFDE | TZ Mk. III | 4 | Various |
| Golar Viking | 140,000 | Golar LNG | Hyundai | Jan-05 | Marshall Is. | S | Moss | 4 | Various |
| Golar Winter | 138,250 | Golar LNG | Daewoo | Apr-04 | Marshall Is. | S | GT NO 96 | 4 | Petrobras |
| Grace Acacia | 150,000 | Algaet Shipping | Hyundai | Jan-07 | Japan | S | TK MK III | 4 | Various |
| Grace Barleria | 150,000 | Swallowtail Ship | Hyundai | Oct-07 | Japan | S | TZ Mk. III | 4 | Various |
| Grace Cosmos | 150,000 | AGH Shipping | Hyundai | Mar-08 | Japan | S | TZ Mk. III | 4 | Various |
| Grace Dahlia | 177,000 | Tokyo Gas | Kawasaki | Oct-13 | Japan | S | Moss | 4 | Various |
| Gracilis | 138,830 | Golar LNG | Hyundai | Jan-05 | Marshall Is. | S | TZ Mk III | 4 | Shell BG |
| Granatina | 140,645 | Shell Shipping | Daewoo | Dec-03 | Singapore | S | GT NO 96 | 4 | Shell |
| Grand Aniva | 147,200 | Sovcomflot/NYK | Mitsubishi | Jan-08 | Japan | S | Moss | 4 | Various |
| Grand Elena | 147,200 | Sovcomflot/NYK | Mitsubishi | Oct-07 | Japan | S | Moss | 4 | Various |
| Grand Mereya | 147,200 | Primorsk/MOL/K Line | Chiba | May-08 | Japan | S | Moss | 4 | Sakhalin II |
| Hanjin Muscat | 138,200 | Hanjin Shipping | Hanjin | Jul-99 | Panama | S | GT NO 96 | 4 | Oman Gas |
| Hanjin Pyeong Taek | 130,600 | Hanjin Shipping | Hanjin | Sep-95 | Panama | S | GT NO 96 | 4 | Pertamina |
| Hanjin Ras Laffan | 138,214 | Hanjin Shipping | Hanjin | Jul-00 | Panama | S | GT NO 96 | 4 | QatarGas |
| Hanjin Sur | 138,333 | Hanjin Shipping | Hanjin | Jan-00 | Panama | S | GT NO 96 | 4 | Oman Gas |
| Hispania Spirit | 140,500 | Teekay LNG Partners | Daewoo | Sep-02 | Spain | S | GT NO 96 | 4 | Atlantic LNG |
| Hoegh Gallant FSRU | 170,050 | Hoegh LNG | Hyundai | May-14 | Marshall Is. | DFDE | TZ Mk. III | 4 | chartered |
| Hoegh Giant FSRU | 170,050 | Hoegh LNG | Hyundai | Jan-18 | Marshall Is. | DFDE | TZ Mk. III | 4 | various |
| Hoegh Grace FSRU | 170,050 | Hoegh LNG | Hyundai | May-15 | Marshall Is. | DFDE | TZ Mk. III | 4 | various |
| Hyundai Aquapia | 135,000 | Hyundai MM | Hyundai | Mar-00 | Panama | S | Moss | 4 | Oman Gas |
| Hyundai | 135,000 | Hyundai MM | Hyundai | Jan-00 | Panama | S | Moss | 4 | RasGas |
| Hyundai Ecopia | 145,000 | Hyundai | Hyundai | Nov-08 | Panama | S | TZ Mk. III | 4 | Various |
| Hyundai Greenpia | 125,000 | Hyundai MM | Hyundai | Nov-96 | Panama | S | Moss | 4 | Pertamina |
| Hyundai Oceanpia | 135,000 | Hyundai MM | Hyundai | Jul-00 | Panama | S | Moss | 4 | Oman Gas |
| Hyundai Technopia | 135,000 | Hyundai MM | Hyundai | Jul-00 | Panama | S | Moss | 4 | RasGas |
| Hyundai Utopia | 125,182 | Hyundai MM | Hyundai | Jun-94 | Panama | S | Moss | 4 | Pertamina |
| Iberica Knutsen | 138,000 | Knutsen OAS | Daewoo | Aug-06 | Norway | S | GT 96 | 4 | Gas Natural |
| Ibra LNG | 147,100 | Oman Gas | Samsung | Jun-06 | Panama | S | TK Mk. III | 4 | Oman LNG |
| Ibri LNG | 145,000 | Oman Gas | Mitsubishi | Jul-06 | Panama | S | TK Mk. III | 4 | Oman LNG |
| Ish | 137,540 | National Gas Shipping | Mitsubishi Nagasaki | Nov-95 | Liberia | S | Moss | 5 | ADGAS |
| K Acacia | 138,017 | Korea Line | Daewoo | Jan-00 | Panama | S | GT NO 96 | 4 | Oman Gas |
| K Freesia | 135,256 | Korea Line | Daewoo | Jun-00 | Panama | S | GT NO 96 | 4 | RasGas |

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| K Jasmine | 145,700 | Korea Line | Daewoo | Mar-08 | Panama | S | GT NO 96 | 4 | Kogas offtake |
| K Mugungwha | 152,000 | K Line | Daewoo | Nov-08 | Panama | S | GT NO 96 | 4 | Various |
| Kita LNG | 160,106 | TMSC Gas | Daewoo | Jun-14 | Malta | TFDE | GT No 96 | 4 | Various |
| Kotawaka Maru | 125,200 | J3 Consortium | Kawasaki Sakaide | Jan-84 | Japan | S | Moss | 5 | Darwin |
| Kumul | 172,000 | MOL | Hudong | May-16 | Hong Kong | DRL | GT NO. 96 | 4 | PNG-Asia |
| Lalla Fatma N'Soumer | 145,000 | Algeria Nippon Gas | Kawasaki Sakaide | Dec-04 | Bahamas | S | Moss | 4 | Various |
| Lijmilya | 261,700 | QGTC | Daewoo | Sep-08 | Marshall Is. | DRL | GT NO. 96 | 5 | Various |
| LNG Abalamabie | 174 900 | Bonny Gas | Samsung | Nov-16 | Bermuda | DFDE | TZ Mk III | 4 | Nigeria LNG |
| LNG Abuja | 126,530 | Bonny Gas Transport | GD Quincy | Sep-80 | Bahamas | S | Moss | 5 | Nigeria LNG |
| LNG Abuja II | 174 900 | Bonny Gas | Samsung | Oct 16 | Bermuda | DFDE | TZ Mk III | 4 | Nigeria LNG |
| LNG Adamawa | 141,000 | Bonny Gas Transport | Hyundai | Jun-05 | Bermuda | S | Moss | 4 | Various |
| LNG Akwa Ibom | 141,000 | Bonny Gas Transport | Hyundai | Nov-04 | Bermuda | S | Moss | 4 | Various |
| LNG Aquarius | 126,300 | MOL/LNG Japan | GD Quincy | Jun-77 | Marshall Is. | S | Moss | 5 | Various |
| LNG Barka | 153,000 | NYK | Kawasaki | Jan-09 | Bahamas | S | Moss | 4 | Various |
| LNG Bayelsa | 137,500 | Bonny Gas Transport | Hyundai | Feb-03 | Bermuda | S | Moss | 4 | Nigeria LNG |
| LNG Benue | 145,700 | BW Gas | Daewoo | Mar-06 | Bermuda | S | GT NO 96 | 4 | Nigeria LNG |
| LNG Bonny | 177,000 | Bonny Gas Transport | Hyundai | Oct-15 | Bermuda | DFDE | TZ Mk III | 4 | Nigeria LNG |
| LNG Borno | 149,600 | NYK Line | Samsung | Aug-07 | Japan | S | TZ Mk. III | 4 | Nigeria LNG |
| LNG Capricorn | 126,300 | MOL/LNG Japan | GD Quincy | Jun-78 | Marshall Is. | S | Moss | 5 | Pertamina |
| LNG Cross River | 141,000 | Bonny Gas Transport | Hyundai | Sep-05 | Bermuda | S | Moss | 4 | Various |
| LNG Dream | 145,000 | Osaka Gas | Kawasaki | Sep-06 | Japan | S | Moss | 4 | Woodside Energy |
| LNG Ebisu | 147,500 | MOL | Kawasaki | Sep-08 | Bahamas | S | Moss | 4 | Various |
| LNG Edo | 126,530 | Bonny Gas Transport | GD Quincy | May-80 | Bahamas | S | Moss | 5 | Nigeria LNG |
| LNG Enugu | 145,000 | BW Gas | Daewoo | Oct-05 | Bermuda | S | GT NO 96 | 4 | Nigeria LNG |
| LNG Fimina | 175,000 | Bonny Gas Transport | Samsung | Oct-15 | Bermuda | DFDE | TZ Mk III | 4 | Nigeria LNG |
| LNG Flora | 127,700 | J3 Consortium | Kawasaki Sakaide | Mar-93 | Japan | S | Moss | 4 | Pertamina |
| LNG Fukurokuju | 165,000 | MOL | Kawasaki | June-15 | Japan | S | Moss | 4 | Various |
| LNG Gemini | 126,300 | MOL/LNG Japan | GD Quincy | Sep-78 | Marshall Is. | S | Moss | 5 | Pertamina |
| LNG Imo | 148,300 | BW Gas | Daewoo | Jun-08 | Bermuda | S | GT NO 96 | 4 | Nigeria LNG |
| LNG Jamal | 135,330 | Osaka Gas/J3 Consortium | Mitsubishi Nagasaki | Oct-00 | Japan | S | Moss | 5 | Oman Gas |
| LNG Jupiter | 145,000 | NYK Line | Kawasaki | Jul-09 | Bahamas | S | Moss | 4 | Various |
| LNG Jurojin | 155,300 | MOL | MHI Nagasaki | Nov-15 | Japan | S | KM | 4 | Various |
| LNG Kano | 148,471 | BW Gas | Daewoo | Jan-07 | Bermuda | S | GT No. 96 | 4 | NLNG |
| LNG Lagos | 177,000 | Bonny Gas | Hyundai | Oct-15 | Bermuda | DFDE | TZ Mk III | 4 | Nigeria LNG |
| LNG Leo | 126,400 | MOL/LNG Japan | GD Quincy | Dec-78 | Marshall Is. | S | Moss | 5 | Pertamina |
| LNG Lerici | 65,000 | Exmar | Italcantieri Sestri | Mar-98 | Italy | S | GT NO 96 | 4 | Sonatrach |
| LNG Libra | 126,400 | Hoegh LNG | GD Quincy | Apr-79 | Marshall Is. | S | Moss | 5 | Various |
| LNG Lokoja | 148,300 | BW Gas | Daewoo | Dec-06 | Bermuda | S | GT No. 96 | 4 | Nigeria LNG |
| LNG Mars | 155,000 | MOL/Osaka Gas | Mitsubishi | Oct-16 | Marshall Is. | S | Moss | 5 | Various |
| LNG Ogun | 148,300 | NYK Line | Samsung | Aug-07 | Japan | S | TZ Mk. III | 4 | Nigeria LNG |
| LNG Ondo | 148,300 | BW Gas | Daewoo | Sep-07 | Bermuda | S | GT NO 96 | 4 | Nigeria LNG |
| LNG Oyo | 140,500 | BW Gas | Daewoo | Dec-05 | Bermuda | S | GT NO 96 | 4 | Nigeria LNG |
| LNG Pioneer | 138,000 | MOL | Daewoo | Jul-05 | Bahamas | S | GT No 96 | 4 | Idku |
| LNG Port Harcourt | 175,000 | Bonny Gas | Samsung | Oct-15 | Bermuda | DFDE | TZ Mk III | 4 | Nigeria LNG |
| LNG Portovenere | 65,000 | Exmar | Italcantieri Sestri | Jun-96 | Italy | S | GT No 96 | 4 | Sonatrach |
| LNG River Niger | 141,000 | Bonny Gas Transport | Hyundai | May-06 | Bermuda | S | Moss | 4 | Various |
| LNG River Orashi | 145,910 | BW Gas | Daewoo | Nov-04 | Bermuda | S | GT No 96 | 4 | Nigeria LNG |
| LNG Rivers | 137,231 | Bonny Gas Transport | Hyundai | Jun-02 | Bermuda | S | Moss | 4 | Nigeria LNG |
| LNG Saturn | 153,000 | MOL | MHI | Nov-15 | Japan | S | Moss | 4 | Various |
| LNG Sokoto | 137,231 | Bonny Gas Transport | Hyundai | Aug-02 | Bermuda | S | Moss | 4 | Nigeria LNG |
| LNG Taurus | 126,300 | MOL/LNG Japan | GD Quincy | Aug-79 | Marshall Is. | S | Moss | 5 | Various |
| LNG Venus | 155,000 | Osaka/MOL | MHI | Oct-14 | Japan | S | Moss | 4 | Various |
| LNG Vesta | 127,547 | Tokyo Gas Consortium | Mitsubishi Nagasaki | Jun-94 | Japan | S | Moss | 4 | Pertamina |
| LNG Virgo | 126,400 | MOL/LNG Japan | GD Quincy | Dec-79 | Marshall Is. | S | Moss | 5 | Pertamina |
| Lobito | 160,400 | Mitsui/NYK/Teekay | Samsung | Oct-11 | Bahamas | DFDE | TZ Mk. III | 4 | Various |
| Lusail | 138,000 | Peninsular LNG | Samsung | May-05 | Bahamas | S | TZ Mk. III | 4 | Qatar |
| Macoma | 173,400 | Teekay | Daewoo | Oct-17 | Bahamas | DFDE | GT No. 96 | 4 | Various |
| Madrid Spirit | 138,000 | Teekay LNG Partners | IZAR Puerto Real | Jan-05 | Spain | S | GT No 96 | 4 | Engas |
| Magellan Spirit | 165,500 | Teekay LNG Partners | Samsung | Sep-08 | Denmark | DFDE | TZ Mk. III | 4 | Various |
| Malanje | 160,400 | Mitsui/NYK/Teekay | Samsung | Jul-11 | Bahamas | DFDE | TZ Mk. III | 4 | Various |
| Maran Gas Achilles | 174,000 | Maran | Hyundai Samho | Feb-16 | Greece | DFDE | GT No 96 | 4 | Various |
| Maran Gas Agamemnon | 174,000 | Maran | Hyundai Samho | May-16 | Greece | DFDE | GT No 96 | 4 | Various |
| Maran Gas Alexandria | 161,870 | Maran | Hyundai Samho | Sep-15 | Greece | DFDE | TZ Mk. III | 4 | Various |
| Maran Gas Amphipolis | 173,400 | Maran | Daewoo | Aug-16 | Greece | DFDE | GT No 96 | 4 | Various |
| Maran Gas Apollonia | 161,870 | Maran | Daewoo | Jan-14 | Greece | DFDE | GT No 96 | 4 | Various |
| Maran Gas Asclepius | 145,000 | Kristen Navigation | Daewoo | Jul-05 | Bermuda | S | GT No 96 | 4 | Qatar |
| Maran Gas Coronis | 145,700 | Maran | Daewoo | Sep-07 | Greece | S | GT No 96 | 4 | Rasgas II |
| Maran Gas Delphi | 159,800 | Maran | Daewoo | Feb-14 | Greece | DFDE | GT No 96 | 4 | Various |
| Maran Gas Efessos | 159,800 | Maran | Daewoo | Jun-14 | Greece | DFDE | GT No 96 | 4 | Various |
| Maran Gas Hector | 174,000 | Maran | Hyundai Samho | Nov-16 | Greece | DFDE | GT No 96 | 4 | Various |
| Maran Gas Lindos | 159,800 | Maran | Daewoo | Jun-15 | Greece | DFDE | GT No. 96 | 4 | Various |
| Maran Gas Mystras | 155,900 | Maran Gas | Daewoo | May-15 | Greece | DFDE | GT No 96 | 4 | Various |
| Maran Gas Olympias | 174,500 | Maran | DSME | Feb-17 | Greece | DFDE | GT No 96 | 4 | Various |
| Maran Gas Pericles | 174,000 | Maran | Hyundai Samho | June-16 | Greece | DFDE | GT No 96 | 4 | Various |
| Maran Gas Posidonia | 161,870 | Maran | Daewoo | May-14 | Greece | DFDE | GT No 96 | 4 | Various |
| Maran Gas Roxana | 173,400 | Maran | Daewoo | Jan-17 | Greece | DFDE | GT No 96 | 4 | Various |
| Maran Gas Sparta | 161,870 | Maran | Hyundai Samho | April-15 | Greece | DFDE | G TZ Mk. III | 4 | Various |
| Maran Gas Troy | 155,900 | Maran Gas | Daewoo | May-15 | Greece | DFDE | GT No 96 | 4 | various |
| Maran Gas Ulysses | 174,000 | Maran | Hyundai Samho | Jan-17 | Greece | DFDE | GT No 96 | 4 | Various |
| Maria Energy | 174,000 | Tsakos | Hyundai | Mar-15 | Marshall Is. | TFDE | GTT Mk II | 4 | Various |

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| Marib Spirit | 165,000 | Teekay LNG | Samsung | May-08 | Marshall Is. | DFDE | TZ Mk. III | 4 | Various |
| Matthew | 126,540 | Suez LNG Shiping | Newport News | Jun-79 | Bahamas | S | TZ Mk. I | 6 | Atlantic LNG |
| Mekaines | 266,000 | Naklilat | Samsung | Mar-09 | Liberia | DRL | GT No 96 | 4 | Qatar-Atlantic Basin |
| Meridian Spirit | 165,500 | Teekay LNG | Samsung | Jan-10 | Denmark | DFDE | TZ Mk. III | 4 | Various |
| Mesaimeer | 210,100 | Naklilat | Hyundai | Mar-09 | Liberia | DRL | GT No 96 | 4 | Qatar-Atlantic Basin |
| Methane Alison Victoria | 145,000 | GasLog | Samsung | Aug-07 | Bermuda | S | TZ III | 4 | Eq.Guinea LNG |
| Methane Becki Anne | 170,000 | GasLog | Samsung | Sep-10 | Bermuda | TFDE | TZ Mk. III | 4 | Various |
| Methane Heather Sally | 145,000 | GasLog | Samsung | Jul-07 | Bermuda | S | Tz Mk. III | 4 | Eq.Guinea LNG |
| Methane Jane Elizabeth | 145,000 | GasLog | Samsung | Jun-06 | Bermuda | TFDE | TZ Mk. III | 4 | Engas |
| Methane Julia Louise | 170,000 | GasLog | Samsung | Dec-09 | Bermuda | TFDE | TZ Mk. III | 4 | Various |
| Methane Kari Elin | 138,200 | Shell | Samsung | Jun-04 | Bermuda | S | TZ Mk. III | 4 | Various |
| Methane Lake Charles | 145,000 | Shell | Samsung | Feb-07 | Bermuda | S | TZ Mk. III | 4 | Marathon Oil |
| Methane Lydon Volney | 145,000 | Shell | Samsung | Aug-06 | Bermuda | S | TZ Mk. III | 4 | Engas |
| Methane Mickie Harper | 170,000 | Shell-GasLog | Samsung | Nov-10 | Bermuda | TFDE | TZ Mk. III | 4 | Various |
| Methane Nile Eagle | 145,000 | Shell-GasLog | Samsung | Dec-07 | Bermuda | S | TZ Mk. III | 4 | Engas |
| Methane Patricia Camila | 170,000 | Shell-GasLog | Samsung | Oct-10 | Bermuda | TFDE | TZ Mk. III | 4 | Various |
| Methane Princess | 138,159 | Golar LNG | Daewoo | 2003 | UK | S | GT No 96 | 4 | Spot BG |
| Methane Rita Andre | 145,000 | GasLog | Samsung | Mar-06 | Bermuda | S | TZ Mk. III | 4 | Engas |
| Methane Shirley Elizabeth | 145,000 | GasLog | Samsung | Apr-07 | Bermuda | S | TZ Mk. III | 4 | Marathon Oil |
| Methane Sprit | 165,000 | Teekay LNG | Samsung | Mar-08 | Singapore | DFDE | TZ Mk. III | 4 | Various |
| Milaha Qatar | 145,000 | Milaha | Samsung | Apr-06 | Denmark | S | TZ Mk. III | 4 | Qatar |
| Milaha Ras Laffan | 138,270 | Milaha | Samsung | Mar-04 | Denmark | S | TZ Mk. III | 4 | RasGas II |
| Min Lu | 147,000 | China Ships | Hudong | Aug-09 | China | S | GT No 96 | 4 | Various |
| Min Rong | 147,000 | China LNG Ships | Hudong | Feb-09 | Hong Kong | S | GT No 96 | 4 | Australia-China |
| Mourad Didouche | 126,130 | SNTM-Hyproc | Atlantique | Jul-80 | Algeria | S | GT No 85 | 5 | Sonatrach |
| Mozah | 266,000 | QGTC | Samsung | Aug-08 | Qatar | DRL | TZ Mk III | 5 | Qatargas II |
| Mraweh | 137,000 | National Gas Shipping | Kvaerner-Masa | Jun-96 | Liberia | S | Moss | 4 | ADGAS |
| Mubaraz | 137,000 | National Gas Shipping | Kvaerner-Masa | Jan-96 | Liberia | S | Moss | 4 | Various |
| Muraq | 210,100 | J5-K Line | Daewoo | May-08 | Marshall Is. | DRL | GT No 96 | 4 | Qatar-Atlantic Basin |
| Murex | 173,400 | Teekay | Daewoo | Oct-17 | Bahamas | DFDE | GT No 96 | 4 | Various |
| Murwab | 210,100 | J5 Consortium | Daewoo | May-08 | Marshall Is. | DRL | GT No. 96 | 4 | Qatargas |
| Muscat LNG | 149,170 | Oman Gas/MOL | Kawasaki Sakaide | Mar-04 | Japan | S | Moss | 4 | Oman Gas |
| Neo Energy | 149,700 | Tsakos | Hyundai | Feb-07 | Liberia | S | GTT Mk II | 4 | Various |
| Nizwah LNG | 145,000 | Oryx LNG Carriers | Kawasaki Sakaide | Dec-05 | Japan | S | Moss | 4 | Oman Gas |
| Northwest Sanderling | 127,525 | Australia LNG | Mitsubishi Nagasaki | Jun-89 | Australia | S | Moss | 4 | NWS |
| Northwest Sandpiper | 127,500 | Australia LNG | Mitsui Chiba | Feb-93 | Australia | S | Moss | 4 | NWS |
| Northwest Seaeagle | 127,450 | Australia LNG | Mitsubishi Nagasaki | Nov-92 | Bermuda | S | Moss | 4 | NWS |
| Northwest Shearwater | 127,500 | Australia LNG | Kawasaki Sakaide | Sep-91 | Bermuda | S | Moss | 4 | NWS |
| Northwest Snipe | 127,747 | Australia LNG | Mitsui Chiba | Sep-90 | Australia | S | Moss | 4 | NWS |
| Northwest Stormpetrel | 127,600 | Australia LNG | Mitsubishi Nagasaki | Dec-94 | Australia | S | Moss | 4 | NWS |
| Northwest Swallow | 127,708 | J3 Consortium | Mitsui Chiba | Nov-89 | Japan | S | Moss | 4 | NWS |
| Northwest Swan | 138,000 | Australia LNG | Daewoo | Mar-04 | Australia | S | GT NO 96 | 4 | NWS |
| Northwest Swift | 127,590 | J3 Consortium | Mitsubishi Nagasaki | Sep-89 | Japan | S | Moss | 4 | NWS |
| Oak Spirit | 173,400 | Teekay | Daewoo | Jan-16 | Bahamas | MEGI-DF | NO. 96 GW | 4 | Cheniere |
| Ob River | 150,000 | Lance Shipping | Hyundai | Oct-07 | Marshall Is. | S | TZ Mk. III | 4 | Various |
| Onaiza | 210,100 | Nakilat | Daewoo | Apr-09 | Liberia | DRL | GT NO 96 | 4 | Qatar-Atlantic Basin |
| Ougarta | 170,000 | Algeria Hyproc | Hyundai | Dec-16 | Bahamas | DFDE | GTT Mk III | 4 | Sonatrach, Various |
| Pacific Arcadia | 147,200 | NYK Line | MHI | Oct-14 | Bahamas | S | KM | 4 | Various |
| Pacific Enlighten | 145,000 | LNG MT | Mitsubishi | Mar-09 | Japan | S | Moss | 4 | Various |
| Pacific Eurus | 137,000 | LNG Marine Transport | Mitsubishi Nagasaki | Mar-06 | Bahamas | S | Moss | 4 | Darwin |
| Pacific Mimosa | 155,300 | NYK Line | MHI | Nov-17 | Bahamas | S | Moss | 4 | Australia-Japan |
| Pacific Notus | 137,006 | Pacific LNG Shipping | Mitsubishi Nagasaki | Sep-03 | Bahamas | S | Moss | 5 | Darwin |
| Palu LNG | 160,106 | TMSC Gas | Daewoo | Jun-14 | Malta | TFDE | GT No 96 | 4 | Various |
| Pan Asia | 174,000 | Teekay | Hudong-Zhonghua | July-17 | Bahamas | TFDE | NO. 96 GW | 4 | Cheniere |
| Papua | 171,800 | MOL-China | Hudong | Jan-15 | Hong Kong | DFDE | SSD | 4 | PNG LNG |
| Polar Eagle | 89,880 | Polar LNG | IHI Chita | Jun-93 | Liberia | S | IHI SPB | 4 | ConocoPhillips/Marathon |
| Prachi | 173,000 | NYK-SCI | Hyundai | Nov-16 | Singapore | TFDE | GT No 96 | 4 | Petronet |
| Provalys | 153,500 | Gaz de France | Chantiers | Nov-06 | France | DFDE | CS1 | 4 | ELNG |
| Pskov | 170,200 | SovComFlot | STX | Mar-14 | Liberia | DFDE | GT No. 96 | 4 | Various |
| Puteri Delima | 130,400 | MISC | Atlantique | Jan-95 | Malaysia | S | GT NO 96 | 4 | Petronas |
| Puteri Delima Satu | 137,100 | MISC | Mitsui Chiba | Apr-02 | Malaysia | S | GT NO 96 | 4 | Petronas |
| Puteri Firuz | 130,400 | MISC | Atlantique | May-97 | Malaysia | S | GT NO 96 | 4 | Petronas |
| Puteri Firuz Satu | 137,100 | MISC | Mitsubishi Nagasaki | Sep-04 | Malaysia | S | GT NO 96 | 4 | Petronas |
| Puteri Intan | 130,400 | MISC | Atlantique | Aug-94 | Malaysia | S | GT NO 96 | 4 | Petronas |
| Puteri Intan Satu | 137,100 | MISC | Mitsubishi Nagasaki | Dec-01 | Malaysia | S | GT NO 96 | 4 | Petronas |
| Puteri Mutiera Satu | 137,100 | MISC | Mitsui Chiba | Apr-05 | Malaysia | S | GT NO 96 | 4 | Petronas |
| Puteri Nilam | 130,400 | MISC | Atlantique | Jun-95 | Malaysia | S | GT NO 96 | 4 | Petronas |
| Puteri Nilam Satu | 137,100 | MISC | Mitsubishi Nagasaki | Sep-03 | Malaysia | S | GT NO 96 | 4 | Petronas |
| Puteri Zamrud | 130,400 | MISC | Atlantique | May-96 | Malaysia | S | GT NO 96 | 4 | Petronas |
| Puteri Zamrud Satu | 137,100 | MISC | Mitsui Chiba | Apr-87 | Malaysia | S | GT NO 96 | 4 | Atlantic LNG |
| Raahi | 136,000 | Petronet LNG Ltd | Daewoo | Dec-04 | Malta | S | GT NO 96 | 4 | Qatargas |
| Ramdane Abane | 126,130 | SNTM-Hyproc | Atlantique | Jul-81 | Algeria | S | GT NO 85 | 5 | Sonatrach |
| Rasheeda | 266,000 | QGTC | Samsung | Jun-10 | Liberia | DRL | TZ Mk. III | | Various |
| Ribera del Duero Knutsen | 173,400 | Knutsen | Daewoo | Nov-10 | Nor-NIS | DFDE | GT NO. 96 | 4 | Various |
| Rioja Knutsen | 176,300 | Knutsen | Daewoo | Dec-16 | Nor-NIS | DFDE | TZ Mk III | 4 | Various |
| Salalah LNG | 147,000 | Oman Gas/MOL | Samsung | Dec-05 | Japan | S | TZ Mk. III | 4 | Oman |
| SCF Polar | 71,500 | Sovcomflot | Kockums | Aug-69 | Liberia | S | GT NO 82 | 6 | Sonatrach |
| Seishu Maru | 162,000 | K Line-Transpacific | Kawasaki Sakaide | Jan-15 | Panama | S | Moss | 4 | Australia-Japan |
| Seri Alam | 138,000 | MISC | Samsung | Oct-05 | Malaysia | S | TZ Mk. III | 4 | Yemen LNG |
| Seri Amanah | 145,000 | MISC | Samsung | Mar-06 | Malaysia | S | TZ Mk. III | 4 | Yemen LNG |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Seri Anggun | 145,000 | MISC | Samsung | Nov-06 | Malaysia | S | TZ Mk. III | 4 | Yemen LNG |
| Seri Angkasa | 145,000 | MISC | Samsung | Feb-07 | Malaysia | S | TZ Mk. III | 4 | Petronas |
| Seri Ayu | 145,000 | MISC | Samsung | Oct-07 | Malaysia | S | TZ Mk. III | 4 | Various |
| Seri Bakti | 152,300 | MISC | Mitsubishi | Mar-07 | Malaysia | S | GT NO 96 | 4 | Petronas |
| Seri Balhaf | 152,000 | MISC | Mitsubishi | Sep-08 | Malaysia | S | GT NO 96 | 4 | Various |
| Seri Balquis | 152,000 | MISC | Mitsubishi | Dec-08 | Malaysia | S | GT NO 96 | 4 | Various |
| Seri Begawan | 152,300 | MISC | Mitsubishi | Dec-07 | Malaysia | S | GT NO 96 | 4 | Various |
| Seri Bijaksana | 152,300 | MISC | Mitsubishi | Feb-08 | Malaysia | S | GT NO 96 | 4 | Petronas |
| Seri Camar | 150,200 | MISC | Hyundai | Feb-18 | Malaysia | S | Moss | 4 | Petronas |
| Seri Camellia | 150,000 | MISC | Hyundai | Nov-16 | Malaysia | S | Moss | 4 | Petronas |
| Seri Cemara | 150,200 | MISC | Hyundai | Apr-18 | Malaysia | S | Moss | 4 | Petronas |
| Seri Cempak | 150,200 | MISC | Hyundai | Feb-18 | Malaysia | S | Moss | 4 | Petronas |
| Seri Cenderawasih | 150,000 | MISC | Hyundai | Jan-17 | Malaysia | S | Moss | 4 | Petronas |
| Sestao Knutsen | 138,000 | Knutsen | IZAR Sestao | Jan-07 | Spain | S | GT NO 96 | 4 | Atlantic LNG |
| Sevilla Knutsen | 173,400 | Knutsen | Daewoo | Jun-10 | N.I.S. | DFDE | GT NO 96 | 4 | Various |
| Shahamah | 135,500 | National Gas Shipping | Kawasaki Sakaide | Oct-94 | Liberia | S | Moss | 5 | ADGAS |
| Shangra | 266,000 | QGTC | Samsung | Nov-09 | Liberia | DRL | TZ Mk. III | 5 | Qatargas IV |
| Shen Hai | 147,100 | China LNG | Hudong Zhonghua | Sep-12 | China | AB/CC Steam | GT NO 96 | 4 | Various |
| Simaisma | 147,700 | Maran Gas Maritime | Daewoo | Jul-06 | Greece | S | GT No 96 | 4 | Qatar |
| SK Audace | 180,000 | SK-Marubeni | Samsung | Jul-17 | Panama | DFDE | TZ Mk. III | 4 | Various |
| SK Splendor | 138,375 | SK Shipping | Samsung | Mar-00 | Panama | S | TZ Mk. III | 4 | Oman Gas |
| SK Stellar | 138,375 | SK Shipping | Samsung | Dec-00 | Panama | S | TZ Mk. III | 4 | RasGas |
| SK Summit | 138,000 | SK Shipping | Daewoo | Aug-99 | Panama | S | GT NO 96 | 4 | RasGas |
| SK Sunrise | 138,306 | I. S. Carriers | Samsung | Sep-03 | Panama | S | TZ Mk. III | 4 | RasGas |
| SK Supreme | 138,200 | SK Shipping | Samsung | Jan-00 | Panama | S | TZ Mk. III | 4 | RasGas |
| Sohar LNG | 137,250 | Oman Gas/ MOL | Mitsubishi Nagasaki | Oct-01 | Malta | S | Moss | 5 | Oman Gas |
| Solaris | 155,000 | GasLog | Samsung | Jul-14 | Bermuda | TFDE | TZ Mk. III | 4 | Various |
| Sonangol Benguela | 160,500 | Sonangol | Daewoo | Sep-11 | Bahamas | S | GT No. 96 | 4 | Angola LNG |
| Sonangol Etosha | 160,500 | Sonangol | Daewoo | Sep-11 | Bahamas | S | GT No. 96 | 4 | Angola LNG |
| Sonangol Sambizanga | 160,500 | Sonangol | Daewoo | Sep-11 | Bahamas | S | GT No. 96 | 4 | Angola LNG |
| Southern Cross | 172,000 | MOL | Hudong | May-15 | Hong Kong | DRL | GT NO. 96 | 4 | Various |
| Soyo | 160,400 | Mitsui/NYK/Teekay | Samsung | May-11 | Bahamas | DFDE | TZ Mk. III | 4 | Various |
| Spirit of Hela | 177,000 | MOL | Hyundai | Oct-09 | Panama | DFDE | TZ Mk. III | 4 | Various |
| Stena Blue Sky | 145,700 | Stena | Daewoo | Jan-06 | Panama | S | GT No 96 | 4 | Various |
| Stena Clear Sky | 171,800 | Stena | Daewoo | Sep-10 | Panama | DFDE | GT NO 96 | 4 | Various |
| Stena Crystal Sky | 171,800 | Stena | Daewoo | Jul-10 | Panama | DFDE | GT NO 96 | 4 | Various |
| STX Kolt | 145,700 | STX Panocean | Korea Hanjin | Nov-08 | Panama | DFDE | TZ Mk. III | 4 | Various |
| Suez Point Fortin | 154,200 | Trinity LNG | Koyo Japan | Nov-09 | Panama | S | TZ Mk. III | 4 | Yemen LNG |
| Taitar No. 1 | 145,000 | NYK Line | Mitsubishi | Oct-09 | Liberia | S | Moss | 4 | Various |
| Taitar No. 3 | 145,000 | NYK Line | Mitsubishi | Jan-10 | Liberia | S | Moss | 4 | Various |
| Taitar No. 4 | 145,000 | NYK | Mitsubishi | Jan-10 | Liberia | S | Moss | 4 | Various |
| Tangguh Batur | 145,700 | Sovcomflot/NYK | Daewoo | Dec-08 | Cyprus | S | GT NO 96 | | Tangguh |
| Tangguh Foja | 155,000 | K Line | Samsung | Jul-08 | Panama | DFDE | TZ Mk. III | 4 | Tangguh LNG |
| Tangguh Hiri | 155,000 | Teekay LNG | Hyundai | Nov-08 | IOM | DFDE | TZ Mk. III | 4 | Tangguh |
| Tangguh Jaya | 145,700 | K Line | Samsung | Nov-08 | Panama | DFDE | TZ Mk. III | 4 | Tangguh |
| Tangguh Palung | 155,000 | K Line | Samsung | Mar-09 | Panama | DFDE | TZ Mk. III | 4 | Tangguh |
| Tangguh Sago | 155,000 | Teekay LNG | Hyundai | Mar-09 | IOM | DFDE | TZ Mk. III | 4 | Tangguh LNG |
| Tangguh Towuti | 145,700 | Sovcomflot/NYK | Daewoo | Oct-08 | Cyprus | S | GT NO 96 | 4 | Tangguh |
| Tembek | 216,200 | OSG/Nakilat | Samsung | Sep-07 | Marshall Is. | DRL | TZ Mk. III | 4 | Qatargas II |
| Tenaga Satu | 130,000 | MISC | Dunkerque | Sep-82 | Malaysia | S | GT NO 88 | 5 | Petronas |
| Tessala | 171,800 | Algeria Hyproc | Hyundai | Jan-17 | Bahamas | DFDE | GTT Mk III | 4 | Sonatrach,Various |
| Torben Spirit | 173,000 | Teekay | Daewoo | Feb-17 | Bahama | MEGI-DF | No 96 GW | 4 | Various |
| Trinity Arrow | 154,900 | K Line | Imabari Shipbuilding | Mar-08 | Panama | S | TZ Mk. III | 4 | Various |
| Umm Al Amad | 210,100 | J5 | Daewoo | Aug-08 | Marshall Is. | DRL | GT NO 96 | 4 | Ras Gas III |
| Umm Al Ashtan | 137,000 | National Gas Shipping | Kvaerner- Masa | May-97 | Liberia | S | Moss | 4 | ADGAS |
| Umm Bab | 145,000 | Kristen Navigation | Daewoo | Nov-05 | Bermuda | S | GT NO 96 | 4 | Qatargas |
| Umm Slaal | 266,000 | QGTC | Samsung | Nov-08 | Qatar | DRL | TZ Mk. III | 5 | Qatargas |
| Valencia Knutsen | 173,400 | Knutsen | Daewoo | Sep-10 | Nor-NIS | DFDE | GT NO. 96 | 4 | Various |
| Velikiy Novgorod | 170,200 | SovComFlot | STX | Feb-14 | Liberia | DFDE | GT No. 96 | 4 | Various |
| Wakaba Maru | 125,000 | J3 Consortium | Mitsui Chiba | Apr-85 | Japan | S | Moss | 5 | Pertamina |
| WilEnergy | 125,500 | Awilco LNG | Mitsubishi | Oct-83 | NIS | S | Moss | 5 | Various |
| WilForce | 156,000 | Teekay LNG | Daewoo | Aug-13 | NIS | DFDE | GT NO 96 | 4 | Various |
| WilGas | 125,500 | Awilco LNG | Mitsubishi | Jul-84 | NIS | S | Moss | 5 | Various |
| WilPower | 125,500 | Awilco LNG | Mitsubishi | Jul-84 | NIS | S | Moss | 5 | Various |
| Woodside Cheney | 174,000 | Maran | Hyundai Samho | March-16 | Greece | DFDE | GT No 96 | 4 | Various |
| Woodside Donaldson | 165,500 | Teekay LNG | Samsung | Dec-09 | Singapore | DFDE | TZ Mk. III | 4 | Various |
| Woodside Goode | 159,800 | Maran | Daewoo | Jul-14 | Greece | DFDE | GT No. 96 | 4 | Various |
| Woodside Reeswithers | 173,400 | Maran | Daewoo | Nov-16 | Greece | DFDE | GT No 96 | 4 | Various |
| Woodside Rogers | 155,900 | Maran Gas | DSME | Jul-13 | Greece | DFDE | GT NO 96 | 4 | Various |
| Yari LNG | 159,983 | TMSC Gas | Daewoo | Jun-14 | Malta | TFDE | GT No 96 | 4 | Various |
| Yenisei River | 155,000 | Dynagas | Hyundai | Jul-13 | Marshall Is. | DFDE | TZ Mk. III | 4 | Various |
| YK Sovereign | 127,125 | SK Shipping | Hyundai | Dec-94 | Panama | S | Moss | 4 | Pertamina |
| Zarga | 266,000 | QGTC | Samsung | Dec-09 | Liberia | DRL | TZ Mk. III | 5 | Qatar-Atlantic |
| Zekreet | 135,420 | J4 Consortium | Mitsui Chiba | Dec-98 | Japan | S | Moss | 5 | Qatargas |

*Any observations, additions or suggested revisions to the LNG journal World LNG Carrier Fleet list should be sent to editor@lngjournal.com*

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# LNG Import Terminals

## Explanatory Notes

- The tables do not include the following types of LNG facilities :
  - Small marine satellite terminals receiving LNG from liquefaction plants in their own country (such as exist in Norway) or which receive LNG transhipped from nearby reception terminals in their own country (such as in Japan)
  - Satellite LNG storage facilities that receive LNG transported only by road or rail
- Expansions of LNG reception terminals are only shown if they involve new storage tanks
- Where there is a blank in the table the information is uncertain or unknown.

*Any comments on the tables, and corrections / additional information from terminal shareholders and project developers would be most welcome, and should be sent to John McKay e-mail editor@lngjournal.com*

| Country | Location (Project) | Owners | Start up | Storage Tanks | Storage Capacity |
|---|---|---|---|---|---|
| Belgium | Zeebrugge | Fluxys | 1987 | 4 | 380,000 |
| Canada | Canaport Saint John | Irving Oil, Repsol | 2009 | 3 | 480,000 |
| Chile | Quintero | ENAP, Metrogas, Enagas | 2009 | 3 | 334,000 |
| | Mejillones | Engie, Codelco | 2010 | 1 | 175,000 |
| China | Beihai LNG, Guangxi | Sinopec | 2015 | 4 | 640,000 |
| | Dalian | PetroChina | 2011 | 3 | 480,000 |
| | Dongguan, Guangdong | Jovo Group | 2013 | 2 | 160 000 |
| | Fujian LNG (Xiuyu) | CNOOC, Fujian I&D Corp. | 2008 | 2 | 640,000 |
| | Guangdong | CNOOC,BP | 2006 | 3 | 480,000 |
| | Haikou, Hainan LNG | CNOOC | 2014 | 3 | 480,000 |
| | Ningbo, Zheijang | CNOOC, Zhejiang Energy | 2012 | 3 | 480,000 |
| | Qidong, Jiangsu | Guanghui Energy | 2018 | 1 | 60,000 |
| | Qingdao, Shandong | Sinopec | 2014 | 3 | 480,000 |
| | Rudong | PetroChina | 2011 | 3 | 530,000 |
| | Shanghai | CNOOC, Shenergy Group | 2009 | 3 | 495,000 |
| | Shanghai, Mengtougou | Shanghai Gas | 2008 | 3 | 120 000 |
| | Shenzen, Diefu | CNOOC | 2016 | 2 | 320,000 |
| | Tangshan, Hebei | PetroChina | 2013 | 3 | 480,000 |
| | Tianjin North | Sinopec | 2017 | 2 | 320,000 |
| | Yuedong, Guangdong | CNOOC | 2016 | 2 | 320,000 |
| | Zhoushan Zhejiang | Enn Group | 2018 | 2 | 320,000 |
| | Zhuhai, Gaolan | CNOOC | 2013 | 3 | 480,000 |
| Dominican Republic | Punta Caucedo | AES Andres | 2003 | 1 | 160 000 |
| Finland | Pori | Gasum Skangas | 2016 | 1 | 30,000 |
| France | Fos Tonkin | Elengy | 1972 | 3 | 150,000 |
| | Montoir-de-Bretagne | Elengy | 1980 | 3 | 360,000 |
| | Fos Cavaou | Engie, Total | 2010 | 3 | 330,000 |
| | Dunkirk LNG | EDF, Fluxys, Total | 2016 | 3 | 570,000 |
| Greece | Revithoussa | DEPA | 2000 | 3 | 225,000 |
| India | Dabhol | GAIL, NTPC (Ratnagiri Gas & Power) | 2009 | 3 | 480,000 |
| | Dahej | Petronet LNG | 2004 | 4 | 592,000 |
| | Hazira | Shell India, Total | 2005 | 2 | 320,000 |
| | Kochi, Kerala | Petronet LNG | 2013 | 2 | 320,000 |
| Indonesia | Arun | Pertamina | 2015 | 5 | 507,000 |
| Italy | Panigaglia | Snam | 1969 | 2 | 100,000 |
| | Porto Levante (offshore GBS) | ExxonMobil, Qatar Petroleum, Edison Gas | 2009 | 2 | 250,000 |
| Japan | Negishi | Tokyo Gas | 1969 | 14 | 1,180,000 |
| | Sodegaura | Tokyo Gas | 1973 | 35 | 2,660,000 |
| | Ohgishima | Tokyo Gas | 1998 | 4 | 850,000 |
| | Higashi-Ohgishima | Tokyo Electric | 1984 | 9 | 540,000 |
| | Futtsu | Tokyo Electric | 1985 | 10 | 1,110,000 |
| | Yokkaichi LNG | Chubu Electric | 1988 | 4 | 320,000 |
| | Kawagoe | Chubu Electric | 1997 | 6 | 840,000 |
| | Yokkaichi Works | Toho Gas | 1991 | 2 | 160,000 |
| | Chita LNG Joint | Toho Gas, Chubu Electric | 1978 | 4 | 300,000 |
| | Chita LNG | Toho Gas, Chubu Electric | 1983 | 7 | 640,000 |
| | Chita - Midorihama | Toho Gas | 2001 | 3 | 600,000 |
| | Senboku I | Osaka Gas | 1972 | 4 | 180,000 |
| | Senboku II | Osaka Gas | 1977 | 18 | 1,585,000 |
| | Himeji | Osaka Gas | 1984 | 8 | 740,000 |
| | Himeji LNG | Kansai Electric | 1979 | 7 | 520,000 |
| | Yanai | Chugoku Electric | 1990 | 6 | 480,000 |
| | Niigata | Nihonkai LNG, Tohoku Electric | 1984 | 8 | 720,000 |
| | Oita | Oita Gas, Kyushu Electric | 1990 | 5 | 460,000 |
| | Tobata | Kitakyushu LNG | 1977 | 8 | 480,000 |
| | Fukuoka | Saibu Gas | 1993 | 2 | 70,000 |
| | Sodeshi | Shizuoka Gas | 1996 | 3 | 337,200 |
| | Hatsukaichi | Hiroshima Gas | 1996 | 2 | 170,000 |
| | Kagoshima | Nippon Gas | 1996 | 2 | 136,000 |
| | Shin-Minato | Sendai City Gas | 1997 | 1 | 80,000 |
| | Nagasaki | Saibu Gas | 2003 | 1 | 36,000 |
| | Sakai | Kansai Electric, Cosmo OII | 2006 | 3 | 420,000 |
| | Mizushima | Nippon Oil, Chugoku Electric | 2006 | 2 | 320,000 |
| | Sakaide | Shikoku Electric, Cosmo Oil | 2011 | 1 | 180,000 |
| | Ishikari LNG | Hokkaido Gas, Hokkaido Electric | 2012 | 2 | 380,000 |
| | Okinawa | Okinawa Electric Power | 2012 | 2 | 280,000 |
| | Naoetsu | Inpex | 2013 | 2 | 360,000 |

# LNG Import Terminals (continued)

| Country | Location (Project) | Owners | Start up | Storage Tanks | Storage Capacity |
|---|---|---|---|---|---|
| Japan (continued) | Joetsu | Chubu | 2011 | 3 | 540,000 |
| | Hachinohe LNG | Nippon Oil | 2015 | 2 | 280,000 |
| | Hitachi LNG | Tokyo Gas | 2015 | 1 | 230,000 |
| | Soma Fukushima | Japan Petroleum Exploration | 2017 | 1 | 225,000 |
| Korea | Boryyeong | GS Energy, SK E&S | 2017 | 3 | 200,000 |
| | Incheon | Kogas | 1996 | 20 | 2,880,000 |
| | Kwangyang | POSCO | 2005 | 4 | 530,000 |
| | Pyeong-Taek | Kogas | 1986 | 23 | 3,360,000 |
| | Samcheok | Kogas | 2014 | 3 | 600,000 |
| | Tong-Yeong | Kogas | 2002 | 17 | 2,620,000 |
| Malaysia | Pengerang Johor | Petronas Gas | 2017 | 2 | 400,000 |
| Mexico | Altamira | Vopak, Enagas | 2006 | 2 | 300,000 |
| | Energia Costa Azul | Sempra LNG | 2008 | 2 | 320,000 |
| | Manzanillo | Samsung, Kogas, Mitsui | 2012 | 2 | 300,000 |
| Netherlands | Gate LNG | Gasunie, Royal Vopak | 2011 | 3 | 540,000 |
| Phillipines | Pagbilao LNG | Energy World Corp. | 2017 | 1 | 130,000 |
| Poland | Swinoujscie | Baltic Gaz System | 2015 | 2 | 320,000 |
| Portugal | Sines | REN Atlantico | 2004 | 3 | 390,000 |
| Puerto Rico | Penuelas | EcoElectrica | 2000 | 1 | 160,000 |
| Singapore | Singapore | Singapore Energy Authority | 2013 | 3 | 540,000 |
| Spain | Barcelona | Enagas | 1969 | 8 | 840,000 |
| | Huelva | Enagas | 1988 | 5 | 610,000 |
| | Cartagena | Enagas | 1989 | 5 | 587,000 |
| | Bilbao | Enagas, EVE | 2003 | 3 | 450,000 |
| | Sagunto | GNF, Osaka Gas, Oman Oil | 2006 | 4 | 600,000 |
| | Reganosa, Ferrol | Galicia, Sonatrach, Tojeiro | 2006 | 2 | 300,000 |
| | El Musel, Gijón, | Enagas | 2013 | 2 | 300,000 |
| Taiwan | Yung-An | CPC | 1990 | 6 | 690,000 |
| | Tai-Chung | CPC | 2009 | 3 | 480,000 |
| Thailand | Map Ta Phut | PTT LNG | 2011 | 2 | 320,000 |
| Turkey | Marmara Ereglisi | Botas | 1994 | 3 | 255,000 |
| | Izmir | EgeGaz | 2006 | 2 | 280,000 |
| USA | Everett | Suez LNG NA | 1971 | 2 | 155,000 |
| | Lake Charles | Shell, ETE | 1982 | 4 | 425,000 |
| | Elba Island | Kinder | 2001 | 5 | 535,000 |
| | Cove Point | Dominion | 2003 | 5 | 530,000 |
| | Freeport | Freeport LNG Development | 2008 | 2 | 320,000 |
| | Cameron | Sempra LNG | 2009 | 3 | 480,000 |
| | Golden Pass, TX | Qatar Petroleum, ExxonMobil | 2010 | 5 | 775,000 |
| | Pascagoula, MS | Gulf LNG, Kinder | 2012 | 2 | 320,000 |
| UK | Isle of Grain | National Grid | 2005 | 8 | 1,000,000 |
| | South Hook | ExxonMobil, Qatar Petroleum,Total | 2009 | 5 | 775,000 |
| | Dragon LNG, Milford Haven | Shell, Petronas | 2009 | 2 | 310,000 |

# LNG Import Terminal Projects

| Country | Location/Project | Owners/Project Developers | Start up | Storage Tanks | Storage Capacity |
|---|---|---|---|---|---|
| China | Shenzhen | CNPC Yudean Power | 2021 | 2 | 120,000 |
| | Yangjiang | CNPC Yudean Power | 2023 | 2 | 120,000 |
| Finland | Tornio | Gasum Skangas | 2018 | 1 | 30,000 |
| Gibraltar | Gasnor | Shell | 2018 | 1 | 5,000 |
| India | Ennore | Indian Oil Corp | 2018 | 2 | 320,000 |
| | Mundra | Gujarat State Petroleum, Adani Group | 2018 | 2 | 320,000 |
| | FSRU Andhra Pradesh | Engie, Andhra Pradesh Gas | 2018 | 1 | 135,000 |
| | Pipovav LNG (FSRU), Gujarat | Swan Energy | 2018 | 2 | 320,000 |
| | Andhra Pradesh | Hindustan LNG, Andhra Pradesh | studies | 1 | 135,000 |
| Indonesia | Labuhan Maringgai | Perusahaan Gas Negara | 2018 | 1 | 135,000 |
| Malaysia | Lahad Datu LNG, Sabah | Petronas | 2018 | studies | |
| Panama | Costa Norte | AES | 2018 | 1 | 130,000 |
| UK | Port Meridian, Barrow-in-Furness | Port Meridian Energy Ltd. | 2020 | 1 | 150,000 |
| Uruguay FSRU | Montevideo | Gas Sayago, Mitsui Osk Lines | 2019 | 1 | 230,000 |

# LNG FSRU Import Facilities

| Country | Location (Project) | Owners | Start up |
|---|---|---|---|
| Argentina | Bahia Blanca GasPort | Excelerate/YPF Repsol | 2008 |
| | Escobar GasPort | Excelerate/Enarsa | 2011 |
| Brazil | Pecem, FSRU | Petrobras | 2009 |
| | Guanabara Bay FSRU | Petrobras | 2009 |
| | Salvador, Bahia FSRU | Petrobras | 2013 |
| Colombia | Cartagena FSRU | Promigas, Sociedad Portuaria El Cayao | 2016 |
| Egypt | Ain Sokhna, Suez | EGAS, Hoegh | 2015 |
| | Ain Sokhna, Suez | EGAS, BW Gas | 2015 |
| Indonesia | Lampung | Hoegh LNG, PGN LNG | 2014 |
| | Nusantara (Jakarta Bay) | Golar LNG, Pertimana | 2012 |
| Italy | Livorno | OLT Offshore LNG Toscana | 2013 |
| Jordan | Aqaba, Jordan | Golar LNG | 2015 |
| Kuwait | Mina Al-Ahmadi | KPC | 2009 |
| Lithuania | Klaipeda | Klaipedos Nafta Hoegh LNG | 2014 |
| Malaysia | Malacca FSRU | Petronas | 2012 |
| Malta | FSU Armada Mediterrana | ElectroGas | 2016 |
| Pakistan | Port Qasim | Excelerate, Engro Corp | 2015 |
| | Port Qasim | BW-Mitsui, PGP Consortium | 2017 |
| Turkey | Aliaga FSRU, Neptune | Etki LNG | 2016 |
| | Dortyol FSRU Challenger | Botas | 2018 |
| UAE | Ruwais, Abu Dhabi | Gasco (UAE) | 2016 |
| | Jebel Ali Port, Dubai | DSA (UAE) | 2010 |
| UK | Teesside GasPort | Excelerate | 2007 |

# LNG Export Projects

| Country | Location/Project | Project Developers | Planned Start Up | Number of Trains | Capacity In MTPA |
|---|---|---|---|---|---|
| AUSTRALIA | Browse LNG | Woodside, BHP, BP Chevron, Shell, Mitsubishi, Mitsui | 2021+ | 2 | 10.0 |
| | Ichthys LNG | INPEX, Total | 2018 | 2 | 8.4 |
| | Prelude FLNG | Shell, Inpex, Kogas CPC | 2018 | 1 | 3.5 |
| CANADA | Bear Head LNG, Nova Scotia | LNG Ltd. | 2024 | 4 | 8.0 |
| | GNL Quebec, Saquenay | Freestone Capital and Breyer Capital | 2024 | 4 | 10.0 |
| | Goldboro LNG, Nova Scotia | Pieridae Energy | 2024 | 2 | 10.0 |
| | Kitimat LNG, BC | Woodside, Chevron | 2024 | 2 | 10.0 |
| | LNG Canada, BC | Shell, Mitsubishi, Kogas, PetroChina | 2024 | 2 | 12.0 |
| | Melford LNG project, Nova Scotia | H-Energy Hiranandani Group | Studies | | |
| | Kwispaa FLNG, Vancouver | Steelhead LNG | 2024 | 4 | 12.0 |
| | Vancouver Tilbury | WesPac Midstream | 2021 | 1 | 3.25 |
| | Woodfibre LNG, Squamish | Pacific Oil & Gas Co | 2020 | 2 | 2.1 |
| EQ.GUINEA | Equatorial Guinea Fortuna FLNG | Ophir, Golar LNG, Schlumberger, GEPetrol | 2019 | 1 | 2.0 |
| INDONESIA | Sengkang LNG | Energy World Corp. | 2018 | 4 | 2.0 |
| MALAYSIA | Rotan FLNG (Sabah) | Petronas, Murphy Oil | 2019 | 1 | 1.5 |
| MOZAMBIQUE | Area 1 Onshore | Anadarko Petroleum and partners | 2021 | 2 | 10 |
| | Area 4 Onshore | Eni and partners | 2021 | 2 | 10 |
| | Area 4 FLNG | Eni and partners | 2019 | 1 | 2.5 |
| NIGERIA | NLNG Train 7 | NNPC, Shell, BP, Total | 2020+ | 1 | 8.4 |
| PAPUA NEW GUINEA | Elk-Antelope LNG | Total, ExxonMobil Oil Search, Petromin | Studies | | |
| RUSSIA | Sakhalin II expansion | Gazprom, Shell, Mitsui, Mitsubishi | 2021 | studies | |
| | Vladisvostok LNG | Gazprom, Itochu, various | 2021 | 2 | 10.0 |
| USA | Alaska LNG Nikiski | Alaska Gasline Development Corp. | 2022 | 3 | 20.0 |
| | Annova LNG, Brownsville | Exelon Corp. | 2021 | 6 | 6.0 |
| | Cameron LNG, Louisiana | Sempra, Total, Mitsui, Mitsubishi | 2019 | 3 | 14.95 |
| | Commonwealth LNG, Louisiana | Commonwealth LNG LLP | 2022 | 8 | 9.0 |
| | Corpus Christi Liquefaction, Texas | Cheniere | 2019 | 5 | 22.5 |
| | Delfin LNG, Louisiana | Delfin, Hoegh | 2021 | 3 | 9.0 |
| | Driftwood LNG, Louisiana | Tellurian Investments | 2022 | 6 | 26.0 |
| | Elba Island, Georgia | Kinder Morgan, EIG Energy | 2018 | 10 | 2.5 |
| | Freeport LNG, Texas | Freeport LNG | 2018 | 4 | 20.4 |
| | Golden Pass, Texas | Qatar Petroleum, ExxonMobil | 2021 | 3 | 15.6 |
| | Jordan Cove, Coos Bay | Pembina Corp. | 2024 | 2 | 7.8 |
| | Lake Charles, Louisiana | Shell, ETE | 2024 | 3 | 15.0 |
| | Magnolia LNG | Louisiana LNG Ltd. | 2021 | 4 | 8.0 |
| | Port Arthur LNG | Sempra | 2021 | 2 | 10.0 |
| | Rio Grande LNG | NextDecade | 2021 | 6 | 27.0 |
| | Sabine Pass LNG, Louisiana | Cheniere | 2018-19 | 2 | 9.0 |
| | Texas LNG Brownsville | Chandra, Meyer, Samsung, others | 2021 | 2 | 4.0 |
| | VG LNG (Cameron Parish) | Venture Global | 2021 | 5 | 10.0 |
| | VG LNG (Plaquemines) | Venture Global | 2021 | 10 | 20.0 |

# LNG Exporters

| Country | Location/Project | Shareholders | Start up | Liquefaction | | Storage | |
|---|---|---|---|---|---|---|---|
| | | | | Trains | capacity (nominal) mtpa | No. of tanks | Total capacity $m^3$ |
| ABU DHABI (UAE) | Das Island (Adgas) | ADNOC, Mitsui, BP, Total | 1977 | 2 | 3.2 | 3 | 240,000 |
| | | | 1994 | 1 | 2.5 | | |
| ALGERIA | Arzew | Sonatrach GL4Z | 1964 | 3 | 1.1 | 3 | 35,000 |
| | Arzew | Sonatrach GL1Z | 1978 | 6 | 7.8 | 3 | 300,000 |
| | Arzew | Sonatrach GL2Z | 1980 | 6 | 8.0 | 3 | 300,000 |
| | Arzew | Sonatrach | 2014 | 1 | 4.7 | | |
| | Skikda | Sonatrach GL1K II | 1980 | 3 | 3.0 | 5 | 308,000 |
| | Skikda | Sonatrach (rebuild) | 2013 | 1 | 4.5 | | |
| ANGOLA | Soyo | Sonangol, Chevron, BP, ENI, Total | 2012 | 1 | 5.2 | 2 | 370,000 |
| AUSTRALIA | Karratha | NWS Woodside, Shell, BHP | 1989 | 2 | 5.0 | 4 | 260,000 |
| | | (BP, Chevron | 1992 | 1 | 2.5 | 1 | 130,000 |
| | | (Mistubishi/Mitsui) | 2004 | 1 | 4.4 | 1 | 130,000 |
| | | NWS partners | 2008 | 1 | 4.4 | 1 | 130,000 |
| | Darwin | Darwin (Bayu Undan) ConocoPhillips, Santos, Eni, Inpex, TEPCO, Tokyo Gas | 2006 | 1 | 3.5 | 1 | 188,000 |
| | Australia Pacific LNG | ConocoPhillips, Origin Energy, Sinopec | 2016 | 2 | 7.5 | 2 | 320,000 |
| | Gladstone LNG | Santos, Petronas, Total, Kogas | 2015 | 2 | 7.8 | 2 | 280,000 |
| | Gorgon LNG | Chevron, Shell, ExxonMobil | 2016 | 3 | 15.6 | 2 | 360,000 |
| | Pluto LNG | Woodside, Tokyo Gas, Kansei | 2012 | 1 | 4.8 | 2 | 240,000 |
| | QCLNG | Shell, CNOOC | 2014 | 2 | 8.0 | 2 | 280,000 |
| | Wheatstone LNG | Chevron, Woodside, Kuwait (KUFPEC), Jera, Kyushu | 2017 | 2 | 8.9 | 2 | 300,000 |
| BRUNEI | Lumut | Brunei/Shell/Mitsubishi/Total | 1972-74 | 5 | 7.2 | 3 | 176,000 |
| CAMEROON | Hilli Episeyo FLNG | Kribi Perenco | 2018 | 1 | 1.2 | 1 | 125,000 |
| EGYPT | Damietta | Union Fenosa, EGPC, EGAS | 2004 | 1 | 5.0 | 2 | 300,000 |
| | Idku | EGPC, EGAS, Shell, Total, Petronas | 2005 | 2 | 7.2 | 2 | 280,000 |
| EQ.GUINEA | Bioko Island | Marathon, Sonagas, Mitsui, Marubeni | 2007 | 1 | 3.4 | 2 | 272,000 |
| INDONESIA | Bontang I | Pertamina, VICO, JILCO, Total | 1977 | 2 | 5.2 | 5 | 635,000 |
| | Bontang II | | 1983 | 2 | 5.2 | | |
| | Bontang III | | 1989 | 1 | 2.8 | | |
| | Bontang IV | | 1993 | 1 | 2.8 | | |
| | Bontang V | | 1997 | 1 | 2.8 | | |
| | Bontang VI | | 1999 | 1 | 3.0 | | |
| | Sulawesi LNG | Medco Energi, Pertamina, Mitsubishi | 2015 | 1 | 2.0 | 1 | 170,000 |
| | Tangguh | BP, MI Berau, CNOOC, Nippon, LNG Japan | 2008 | 2 | 7.6 | 2 | 340,000 |
| MALAYSIA | Bintulu (MLNG Satu) | Petronas, Sarawak, Mitsubishi | 1983 | 3 | 8.1 | 4 | 260,000 |
| | Bintulu (MLNG Dua) | Petronas, Shell, Sarawak, Mitsubishi | 1995 | 3 | 7.8 | 1 | 65,000 |
| | Bintulu (MLNG Tiga) | Petronas, Shell, Sarawak, Mitsubishi, Nippon Oil | 2003 | 2 | 6.8 | 1 | 120,000 |
| | Bintulu Train 9 | Petronas | 2016 | 1 | 3.6 | | |
| | Kanowit FLNG | Petronas | 2016 | 1 | 1.2 | | |
| NIGERIA | Bonny Island | NNPC, Shell, Total, Eni | 1999 | 2 | 6.4 | 2 | 168,400 |
| | | Nigeria LNG (formed by above) | 2002 | 1 | 3.2 | 1 | 84,200 |
| | | Nigeria LNG | 2006 | 2 | 8.2 | | |
| | | Nigeria LNG | 2008 | 1 | 4.1 | 1 | 84,200 |
| NORWAY | Snøhvit/Melkoya Island | Statoil, Total, GDF-Suez, Petoro | 2007 | 1 | 4.2 | 2 | 280,000 |
| OMAN | Oman LNG | Oman Govt., Shell, Total, Korea LNG Mitsubishi, Mitsui, Partex and Itochu | 2000 | 2 | 7.1 | 2 | 240,000 |
| | | Oman Govt.,Oman LNG Union Fenosa, Osaka Gas, & Itochu | 2006 | 1 | 3.7 | 2 | 240,000 |
| PAPUA NEW GUINEA | PNG LNG | ExxonMobil, Oil Search, Santos, JX Nippon Oil | 2014 | 2 | 6.9 | 2 | 320,000 |
| PERU | Peru LNG | Hunt Oil, Shell, Marubeni, SK Group | 2010 | 1 | 4.4 | 2 | 260,000 |
| QATAR | Qatargas 1-T1&2 | QP, ExxonMobil, Total, Marubeni, Mitsui | 1997 | 2 | 6.4 | 4 | 340,000 |
| | Qatargas 1-T3 | QP, ExxonMobil, Total, Marubeni, Mitsui | 1999 | 1 | 3.1 | | |
| | Qatargas II-T1 | QP, ExxonMobil | 2009 | 1 | 7.8 | | |
| | Qatargas II-T2 | QP, ExxonMobil, Total | 2009 | 1 | 7.8 | 8 | 1,160,000 |
| | Qatargas III-T1 | QP, ConocoPhillips, Mitsui | 2010 | 1 | 7.8 | | |
| | Qatargas IV-TI | QP, Shell | 2010 | 1 | 7.8 | | |
| | RasGas I- T1&2 | QP, ExxonMobil, Kogas, Itochu, LNG Japan | 1999 | 2 | 6.6 | | |
| | RasGas II- T3 | QP, ExxonMobil | 2004 | 1 | 4.7 | | |
| | RasGas II- T4 | QP, ExxonMobil | 2005 | 1 | 4.7 | 6 | 840,000 |
| | RasGas II- T5 | QP, ExxonMobil | 2007 | 1 | 4.7 | | |
| | Rasgas III – T6 | QP, ExxonMobil | 2009 | 1 | 7.8 | | |
| | Rasgas III – T7 | QP, ExxonMobil | 2010 | 1 | 7.8 | | |
| RUSSIA | Sakhalin Island | (Sakhalin Energy) Gazprom, Shell, Mitsui, Mitsubishi | 2009 | 2 | 9.6 | 2 | 200,000 |
| | Yamal LNG Siberia | Novatek, Total, CNPC, Silk Fund | 2017 | 3 | 16.5 | | |
| TRINIDAD & TOBAGO | Point Fortin Train 1 | BP, Shell, CIC, NGC | 1999 | 1 | 3.0 | 2 | 204,000 |
| | Train 2 | BP, Shell | 2002 | 1 | 3.3 | 1 | 160,000 |
| | Train 3 | BP, Shell | 2003 | 1 | 3.3 | 1 | 160,000 |
| | Train 4 | BP, Shell, NGC | 2005 | 1 | 5.2 | 1 | 160,000 |
| USA | Cheniere Sabine Pass | Cheniere Energy | 2016 | 4 | 18.0 | 5 | 800,000 |
| | Cove Point LNG | Dominion Energy | 2017 | 1 | 5.3 | 7 | 695,000 |
| YEMEN | Bal-Haf | Yemen LNG, Total, Yemen Gas, Hunt Oil, SK Group, Hyundai | 2009 | 2 | 6.7 | 2 | 320,000 |

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