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Various formats of LNG trading develop along with price trends

International Gas Union highlights broadening economic and clean energy role for gas value chain

The LNG market has grown increasingly complex over the past decade, as a greater number of participants utilize a broader variety of trading strategies. While cargoes were historically mainly delivered under long-term fixed destination contracts, a growing portion of LNG is being sold under shorter contracts or on the spot market.

This “non-long-term” LNG trade has been made possible by the emergence of portfolio players and traders, as well as more destination flexibility in contracts, according to the annual report of the International Gas Union.

Long and short

“Non-long-term trade surged in 2011, but then stagnated through 2016 as new LNG supply came mostly from long-term contracted projects,” explained the IGU.

Since then, the volume of LNG traded without a long-term contract has increased significantly, growing by 19 percent year-on-year in 2017 and by 18 percent in 2018.

This recent growth is partially caused by the ramp-up of new flexibly-contracted liquefaction projects in the Atlantic Basin, such as those in the US and Russia.

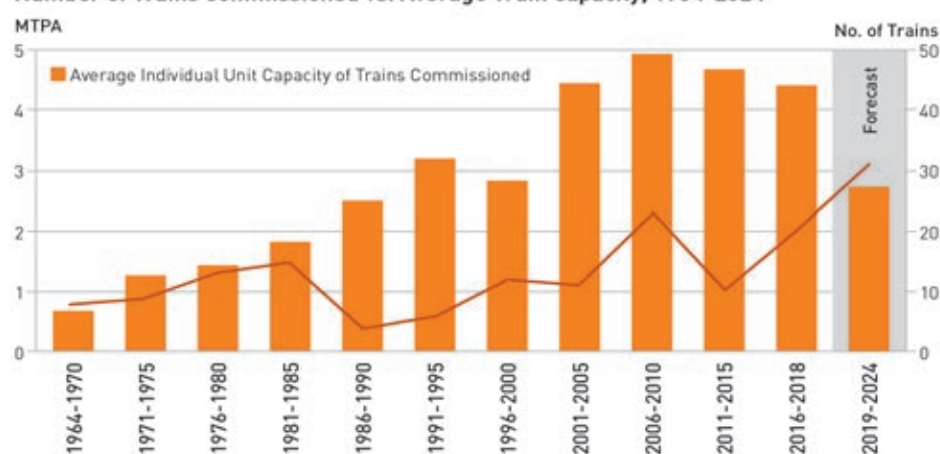
“The share of the LNG market traded without a long-term contract has now reached 31 percent, roughly 50 percent higher than in 2008,” stated the IGU.

Segment

Over the past decade, this segment of the market has developed as a result of several key factors, including:

- The growth in LNG contracts with destination flexibility, which has facilitated diversions to higher priced markets.
- The increase in the number of exporters and importers, which has

Number of Trains Commissioned vs. Average Train Capacity, 1964-2024



Processing capacity growth of forthcoming LNG liquefaction Trains

amplified the complexity of the industry and introduced new permutations and linkages between buyers and sellers. In 2018, 30 markets (including re-exporters) exported spot volumes to 35 end markets. This compares to six spot exporters and eight spot importers in 2000.

- The growth of companies with diverse marketing portfolios taking on an aggregator role, allowing long-term offtake contracts to satisfy a variety of short- and long-term buyer commitments.
- The decline in competitiveness of LNG in inter-fuel competition such as coal in the power sector (chiefly in Europe) and shale gas (North America) that has freed up volumes to be re-directed elsewhere.

Short-term trade is defined here as all volumes traded either on the spot market or under agreements of less than two years.

Growth

“The volume of short-term cargoes last year reached 96MT, or 29.9 percent of total gross traded LNG (including re-exports). As in 2017, the growth in short-term trade was supported by new

liquefaction project start-ups in the Atlantic Basin,” said the IGU.

“Many of the projects in the Atlantic Basin that have come online in the past two years, such as Sabine Pass LNG in the US and Yamal LNG in Russia, have destination-flexible contracts with traders or aggregator companies that have large LNG portfolios,” it noted.

“This contrasts with the marketing structure of projects that started up in the Pacific Basin between 2014 and 2016, which were largely contracted under long-term deals directly with end-users,” added the report.

Volumes traded under medium-term contracts (between 2 and 5 years) remain a comparatively small portion of all non-long-term trade.

True medium-term deliveries, those cargoes both procured and delivered under a medium-term contract, declined for the fourth year in a row in 2018, falling from 7.1MT at peak in 2014 to 3.0MT in 2018.

The report said that this was not necessarily a sign that medium-term contracts are falling out of favour. In fact, the volume of medium-term LNG contracted for delivery in 2018 increased by 26 percent year-on-year.

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Maritime Content Ltd

2 Prospect Road
St Albans AL1 2AX
United Kingdom
www.LNGjournal.com
+44 (0)20 7253 2700

Publisher

Stuart Fryer

Editor

John McKay
editor@lngjournal.com

Advertising

David Jeffries
Only Media Ltd
Tel: +44 (0) 208 150 5293
djeffries@lngjournal.com

Subscriptions Sales Manager

Stephan Venter
Tel: + 44 (0) 7253 2700
venter@lngjournal.com

Production

Vivian Chee
Tel: +44 (0) 20 8995 5540
chee@btconnect.com

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See website for more details
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gabi@lngjournal.com
hotline +44 (0)20 7253 2700

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“The reason for the apparent decline in medium-term trade is that many traditional trader companies that were formerly active only in the spot market have begun to sign medium-term contracts as a seller, though they continue to source spot cargoes to fulfil them,” said the IGU.

Choices

“Thus, medium-term contracts are being filled increasingly with short-term volumes. Medium-term contracts offer markets with uncertain future LNG needs more security of supply for their minimum requirements than would be provided by short-term imports,” it added.

“They have been favoured by buyers hesitant to sign long-term contracts because of the availability of uncontracted and flexible supply,” according to the report.

Total non-long-term LNG trade, all volumes traded under contracts of less than five years or on the spot market, reached 99.0MT in 2018, an increase of 14.5MT relative to 2017.

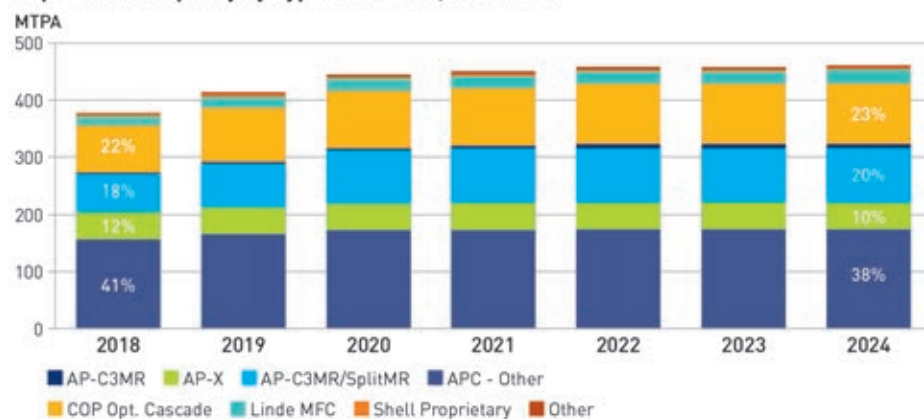
Non-long-term trade accounted for an all-time high 31 percent of total gross LNG trade, a 2 percent increase in the share from 2017.

“With the build-up in long-term contracted Australian capacity set to come to an end in 2019 as the final few projects come online, the share of non-long-term LNG is likely to continue to increase in the near-term, particularly as the build-out in flexibly-contracted Atlantic Basin capacity is still in full swing,” said the IGU.

Buyers

As with total gross LNG trade, the largest increase in non-long-term imports was for

Liquefaction Capacity by Type of Process, 2018-2024



The various LNG processing brands and popularity with developers

market's 41 percent growth in LNG imports pulled heavily from the spot and short-term market, as long-term contracts increased by only 9 percent year-on-year.

Non-long-term Chinese imports grew by 10MT and in early 2018, many Chinese buyers continued to search for additional short-term volumes to meet the growth spurred by anti-pollution measures, and heightened buying activity continued into the summer.

“As in the previous year, South Korea continued to rely on the spot market to offset continued nuclear outages, with non-long-term imports rising by 47 percent in 2018,” said the report.

Contracts

The largest decline in non-long-term imports was in Japan. The return to service of nuclear plants meant that LNG demand started to ease off from the peak level reached in 2015, causing total Japanese LNG imports to edge lower last year by 600,000 tonnes.

That's as several new contracts between Australian LNG plants and Japanese buyers continued to ramp-up during the year, causing non-long-term imports to fall at a much faster rate, down 4MT.

Most LNG-related prices around the world followed an upward trend, influenced by rising oil prices and strong LNG demand in Asia.

Several price markers experienced some volatility in the spring and summer months, but a cold winter at the start of the year and active spot buying

from China kept prices generally elevated.

Significant

“While exports from Australian markets are primarily sent to long-term customers, several plants that ramped-up supply in 2018 were contracted to large aggregator companies that sell into a diverse portfolio of end-markets, both on a contracted and spot basis,” said the IGU.

“Furthermore, the strong demand increase in China led many Australian projects to divert cargoes there rather than to other Pacific markets,” it added.

New Atlantic Basin suppliers also had significant growth in non-long-term supply, owing to flexible destination contracts with aggregators, especially from Yamal LNG in Russia and Sabine Pass LNG in the US.

Although Northeast Asian spot prices fell from an average \$9.88 per million British thermal units in January 2018 to a low of \$7.20 per MMBtu in May 2018, this was 36 percent higher than their level in May 2017.

However, in 2019, spot cargo prices for North Asian markets in China and elsewhere fell in April to under \$5.50 per MMBtu or even lower for various windows.

Spot cargo prices had already shown some signs of weakness toward the end of 2018, as a mild winter in Asia and Europe, coupled with the continued ramp-up of new supply, started to place downward pressure on spot prices.

“European spot prices climbed for most of the year, though a large influx of LNG in the fourth quarter of the year began to place some downward pressure on market prices like the UK's National Balancing Point.

The report stated that as new liquefaction capacity is added in 2019, prices were likely to fall further, particularly during traditional seasonal lulls in demand in the Northern Hemisphere summer months. ■

With the build-up in long-term contracted Australian capacity set to come to an end in 2019 ... the share of non-long-term LNG is likely to continue to increase

China.
The

Australian forecasts for LNG market are mixed with fortunes of thermal coal exports to Asia

Regasification and production expands with cross-basin arbitrage and spot cargo volumes

LNG contract prices, at which most Australian LNG is sold, are forecast to edge down after 2018-2019, as the recent rise in oil prices eases off. Spot cargo prices are also expected to decline in the short term, before recovering in the early 2020s as the global market tightens.

LNG contract prices in Asia, meanwhile, are forecast to moderate as gas pricing arrangements continue to vary from region to region, according to a quarterly resources and energy report from the Australian government.

Linkage

Most LNG in Asia is sold on long-term contracts, sometimes in excess of 20 years, where the price of LNG is linked to the price of oil by a time lag of several months.

Oil-linked contract prices in Asia have

been on the rise since 2016, reaching their highest level in three years in 2018.

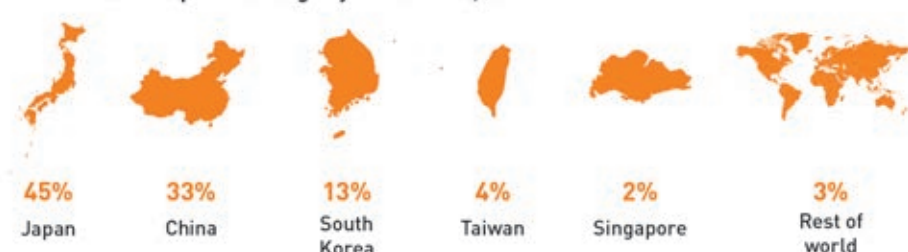
“The average price of LNG imported by Japan has followed higher oil prices over the past few years,” said the report.

“Tracking oil prices, LNG contract prices in Asia are forecast to gradually decline over the five years to 2024,” it forecast.

Spot prices are also expected to decline, having risen over the past few years. Rising spot prices have been driven by surging demand in Asia, particularly from China, and delays in bringing new LNG projects online.

“Rising oil prices have also contributed to higher LNG spot prices. Buyers have some flexibility in the volumes of LNG they purchase on long-term oil price-linked contracts, and higher oil prices thus increase the attractiveness of spot

Australia's LNG export earnings by destination, 2018



Main customers for shipments from Western Australia and Queensland

LNG cargoes relative to contracted volumes, pushing up LNG spot prices,” explained the report.

Spot volumes

“LNG spot prices in Asia averaged US\$10.00 per million British thermal units (MMBtu) in 2018 in real terms, and are expected to decline in 2019 and 2020, as oil prices ease and additions to global LNG supply capacity outstrip growth in

demand,” it added. The report forecast that LNG spot prices could decline to average US\$6.50 per MMBtu and US\$7.10 per MMBtu (in real terms) in 2019 and 2020, respectively.

LNG spot prices began falling towards the end of 2018, just as the Northern Hemisphere winter was starting, a time at which spot prices would usually increase on the back of higher seasonal demand.



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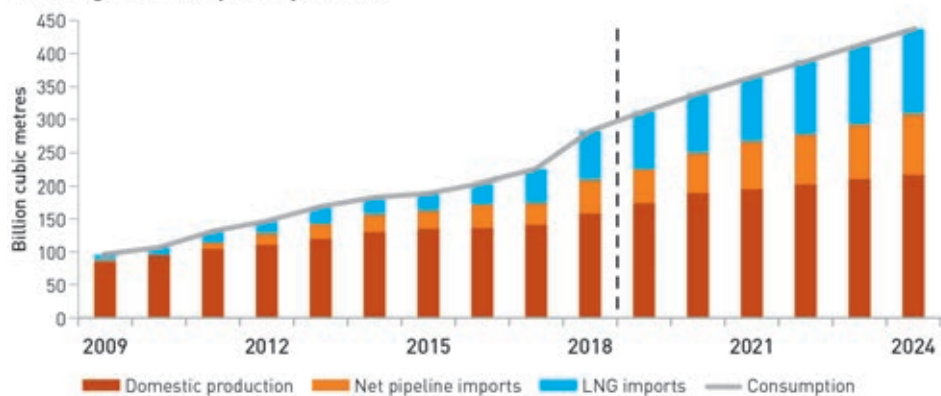


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China's gas consumption by source



Evolution of LNG shipments destined for Chinese import terminals

“The mild Northern Hemisphere winter, coupled with growing supply capacity from the US, Russia and Australia, were contributing factors,” said the report.

Pricing view

“After 2020, LNG spot prices are expected to begin recovering. Supply growth looks likely to slow dramatically in the early 2020s, and demand is consequently expected to begin closing the gap on global production capacity,” it added.

The Australian view is that in 2024, LNG spot prices are likely to average US\$9.40 per MMBtu in real terms.

This report and others believe that from early next decade, the LNG market is expected to begin rebalancing, as demand growth absorbs the available capacity. Capacity growth is expected to slow dramatically from 2021, and demand is expected to increase rapidly driven by emerging Asian countries and Europe.

“These supply-demand dynamics suggest that prices could rise rapidly in the early 2020s if new supply is not brought to market in a timely manner, or if demand increases more quickly than

expected. Volatility in spot prices in the early 2020s is a distinct possibility,” said the report.

“Japan is likely to restart more nuclear power plants over the next five years. Eighteen reactors have applications to restart with the Nuclear Regulation Authority,” it added.

Of these, three are likely to restart between 2019 and 2020. Another three to six may restart by the end of the outlook period in 2024.

Nuclear changes

However, nuclear energy in Japan continues to face public opposition and legal challenges. There remain significant risks of delays and slippages in nuclear restarts.

The report explained how China had exerted a tremendous influence on LNG markets over the past few years.

During 2015 and 2016, sluggish growth in China's LNG demand helped to push the market into a period of overcapacity, which was reversed in 2017 as China's LNG demand soared.

“China's gas consumption continued to rise rapidly in 2018, driven by efforts to improve air quality,” said the report.

China is also targeting domestic gas production of 207 billion cubic metres in 2020, up 30 percent from around 159 Bcm in 2018.

“This includes production targets for conventional and unconventional gas, including shale gas and coal bed methane. However, China faces challenges in lifting domestic output, including difficult geology, and is expected to fall short of its 2020 production target,” it said.

Chinese gas

“Growth in conventional gas production in China has been slowing, while government production targets for unconventional gas have been continually revised down. These challenges are expected to persist over the next couple of years,” it added.

The report also looked at the impact of pipeline natural gas imports by China, set to increase over the next couple of years.

China currently imports pipeline gas from Central Asia and Myanmar. While imports from Myanmar should remain relatively steady, there are plans to expand the capacity of the Central Asia–China Gas Pipeline system from 55 Bcm to 65 Bcm by the end of 2019.

China is also expected to begin importing gas from Russia via the “Power of Siberia” pipeline at the end of 2019, starting at 5 Bcm in the first full year of operation in 2020 and reaching 38 Bcm in 2025.

The report also forecast that South Korea's LNG imports should decline slightly in 2019, before climbing to 53MT in 2024.

Coal competition

“The return of nuclear power generation is expected to drive the short term decline

in South Korea's LNG imports, but South Korea's long-term plan is to shift its energy mix towards renewables and gas, and away from nuclear and coal,” said the report.

“Against this backdrop, the South Korean Government has stated that no new nuclear or coal-fired power stations will be built,” it added.

“The Government has also closed four coal-fired power plants since taking office in May 2017, and has plans to shut a further six by mid-2022,” said the report.

South Korea will also lower taxes on LNG imports and further raise taxes on thermal coal imports.

LNG is in competition with coal around the world and Australia is a big shipper of coal to China, Korea and Japan as well as LNG cargoes.

South Korea's thermal coal imports increased marginally in 2018 to 115 million tonnes. The trial introduction of a cap on the sulphur content of coal burned has likely resulted in a minor substitution towards lower sulphur coal.

South Korean coal imports from Australia fell by 3.5 percent (or 1.2MT).

The Australian Newcastle benchmark spot price is forecast to decline from an average of US\$108 a tonne in 2018 to US\$76 a tonne in 2021, in real terms, as supply growth outpaces demand.

“The price is then expected to recover modestly to reach US\$82 a tonne by 2024, as a lack of new projects constrains world supply,” said the Australian report.

Australia's thermal coal export earnings are forecast to reach a new record of A\$27Bln (US\$19Bln) in 2018-2019, up from an existing record A\$23Bln in 2017-2018, driven by strong prices. ■

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For the Record

CHEVRON Corp. has revived its almost dormant Canadian Kitimat liquefied natural gas project originally proposed with Apache Corp. for Bish Cove in British Canada by applying to regulators for export capacity of up to 18 million tonnes per annum. Chevron, the operator of two LNG export plants in Western Australia, now has Australian company Woodside Petroleum as its partner after Woodside purchased assets from Apache in 2014, including stakes in Wheatstone LNG in Australia and the Kitimat venture in BC. “Chevron and Woodside have applied for a new licence for their Kitimat LNG plant in northern British Columbia that could see it nearly double in size,” said Chevron. The companies have submitted the application to Canada’s National Energy Board with a revised plant design that may include up to three LNG processing Trains instead of two. “Chevron and Woodside have re-evaluated the originally proposed two-Train, 10 MPTA LNG plant development concept, with a focus on improving Kitimat LNG cost of supply competitiveness relative to other global LNG projects,” Chevron said in a statement. The re-launching of the Bish Cove project follows a final investment decision made in October 2018 by the Royal Dutch Shell-led LNG Canada joint venture. Both plant sites are almost adjacent and are located about 650 kilometres north of the province’s largest city, Vancouver. Shell and its Asian partners, including PetroChina, Petronas of Malaysia, Japan’s Mitsubishi and Korea Gas corp. have started work at the brownfield site, also near Kitimat, and which had been an energy products terminal before being acquired by Shell in 2011 when the Chevron project was already progressing nearby.

The Shell project includes a US\$5-billion pipeline of 670 kilometres being developed by TransCanada Corp. to bring the feed-gas from the Montney shale basin in northeast BC to the Pacific Coast. Shell will initially produce 14 MTPA of LNG and has an option to increase its capacity to 28 MTPA. Feed-gas for Chevron’s Kitimat plant will come from the large upstream shale-gas

resources in the 322,000 net acres it has in the Horn River and Liard Basins of northeast BC. Chevron will then transport the gas on the proposed Pacific Trail Pipeline to the site at Bish Cove. The US major noted that its Kitimat LNG project was the most mature of the proposed Canadian LNG ventures and it also has an established partnership with the Haisla First Nation who live in the Kitimat area. “We have key federal and provincial environmental approvals and licenses in place and substantial early work on the LNG site and pipeline route is underway,” said Chevron. Chevron has a 50-50 partnership with Woodside in the Kitimat venture, though they have yet to disclosed cost estimates or investment and construction schedules. The Kitimat joint venture said in March 2018 that it had been drilling some appraisal wells in the Liard Basin, though there has been little progress over several years on the plant development front. However, some environmental and LNG export permits and First Nations benefits agreements are still in place for the liquefaction plant.

CHIYODA Corp., the Japanese LNG engineering company, said it was still working on its recovery plan from the more than \$1 billion of losses incurred from significantly increased project construction costs, particularly at the Cameron project in Louisiana being built by Semptra Energy. Chiyoda said it was implementing countermeasures to reduce costs, obtaining change orders and reviewing settlement conditions from ongoing projects while also finalizing a new recovery strategy. “The past fiscal year was one of the most severe years in Chiyoda’s history,” stated Masaji Santo, President and Chief Executive of the Yokohama-based company in a statement to investors and employees. Shares in Chiyoda, a subsidiary of Mitsubishi Corp., had plunged to a 10-year low at the end of 2018 when losses began to emerge in its earnings forecasts for the Cameron project and other ventures, including the Tangguh LNG plant expansion in Indonesia. Chiyoda has additionally been involved in the main and recently completed global projects such as Ichthys LNG in Australia for Inpex Corp. and French major Total and the Yamal LNG venture in Russia for Novatek, Total and Chinese stakeholders. “We will prioritize the completion of ongoing projects as planned and will soon release a revival plan currently under discussion with stakeholders,” explained Santo.

“Firstly, we will strengthen our risk management capabilities by establishing a Strategy & Risk Integration Division to support corporate management and manage project risks throughout all project phases, including pre-award,” stated the CEO. “Secondly, we will enhance employee capabilities and optimize the allocation of human resources through a career development program that includes rotation between disciplines. We will also recruit additional employees to supplement our revival plan as required,” he added. “Finally, we will structure future business portfolios within Chiyoda. Although it is widely considered within the group that our core business remains the engineering, procurement and construction (EPC) of hydrocarbon plant projects, we can establish new portfolios that embrace the latest business trends within our industry,” stated Santo. The CEO emphasized that his first priority was to complete ongoing projects as planned this fiscal year. “Concurrently however, we will conduct our primary operations more effectively throughout the Chiyoda Group and define future business portfolios,” he added.

DELEK GROUP of Israel is discussing liquefied natural gas marketing possibilities for the giant Leviathan field in the Eastern Mediterranean currently under development and set to come on stream in 2020. Delek Drilling is the largest shareholder in the Leviathan field and is looking into several options for some of the 22 trillion cubic feet of natural gas in the field that has not already been sold to pipeline customers in Israel and Jordan. These include Delek sending volumes by an existing pipeline to Egypt for domestic use or as feed-gas for one of Egypt’s LNG export plants at Damietta or Idku, or setting up its own floating LNG infrastructure. The Israeli company owns more than 45 percent of the Leviathan field while US company Noble Energy is the operator with just short of 40 percent. The balance is held by stock exchange shareholders. Firm pipeline supply agreements have already been signed for the Leviathan project with buyers such as Jordan’s National Electric Power Company, set to take 45 billion cubic metres in a deal lasting at least 15 years. Another Leviathan supply deal has been signed by Israeli company Edeltech, which is buying the gas for power plants it owns with Turkish

partner Zorlu Energy in Ashdod and Mishor Rotem. Delek and Noble have also signed letters of intent to supply Leviathan natural gas to customers in Egypt such as Dolphinus Holdings and the operator of the Idku LNG export plant, now Royal Dutch Shell. The Israeli media has also reported that ExxonMobil was interested in setting up a floating LNG option for the Leviathan project partners to join. The reports explained that while talks with ExxonMobil had taken place, it was too early to say if any agreement was likely.

ExxonMobil and Middle East LNG partner Qatar Petroleum have also recently made a large natural gas discovery in the East Med offshore Cyprus. The ExxonMobil-QP discovery is at the Glaucus-1 well located in their exploration Block 10 in Cypriot waters. Based on preliminary estimates the ExxonMobil resources are between 5 Tcf and 8 Tcf, enough feed-gas for a small-scale FLNG project. Another possibility for the Israelis and Noble is transporting some Leviathan gas volumes to the Egyptian Idku LNG export plant. Idku is east of the city of Alexandria and first came on stream in 2005 and has capacity to ship up to 7.2 million tonnes per annum from two liquefaction Trains. It also has two storage tanks with a combined capacity of 280,000 cubic metres. Idku is now operated by Shell and has been on stream again since 2017 as new Egyptian discoveries turned a natural gas deficit into a surplus. Shell acquired its Idku stake when it completed the takeover of BG Group in 2016. Egypt’s second LNG export plant at Damietta is still idle, but the resolution of a legal dispute between the owners and the Egyptian government has now been resolved. The facility has capacity of 5.5 MTPA of output and has two storage tanks each of 150,000 cubic metres capacity. Damietta is owned by Union Fenosa Gas, a joint venture between Spain’s Gas Natural, now known as Naturgy, and Italian energy company Eni. They hold 80 percent of the shares and the remaining 20 percent belongs to the Egyptian government.

EGYPT said its rising natural gas surplus through 2020 would be used to satisfy demand from the power and industry sectors and to meet LNG export obligations as its overall output reaches more than 5 billion cubic feet per day. The Egyptian Petroleum and Mineral Resources Minister, Tarek El Molla,



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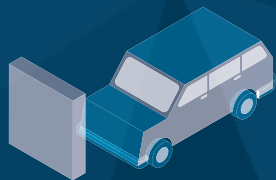
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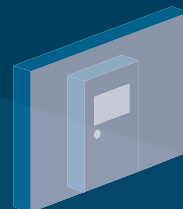
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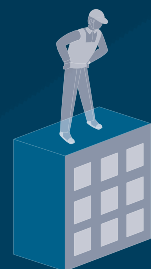
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addressed the nation's natural gas output targets at a World Economic Forum meeting held at a Dead Sea resort at southern Shuneh in Jordan. El Molla said he was pleased with the output from Egypt's natural gas fields on the West Nile Delta, at Noor in North Sinai, the Atoll field in the East Nile Delta and the giant Zohr resources in the East Mediterranean. The Minister noted that Egypt had recently launched an international tender for new exploration licences in 10 areas of the Red Sea where it would also have cooperation from Saudi Arabia. El Molla held talks with his Saudi counterpart Khaled el Faleh on means of boosting joint cooperation. "The two ministers exchanged views on opportunities of oil and gas exploration in the Red Sea and means of intensifying search and exploration operations in the coming phase," said a statement. At the same time the Egyptian minister said the nation was pursuing LNG exports from the Idku liquefaction plant near Alexandria, which resumed in 2017, and was also set to restart production at the nearby Damietta LNG facility. "We are exporting 1.1 billion cubic feet per day and we expect that by the end of the year this figure will go up to 2 bcf per day, and this is when we resume the operation of the Damietta plant," said El Molla. "The second plant is expected to operate within this year," added the Minister.

On the Red Sea tenders, interested companies have been given until August to submit their bids for the 10 licences to be issued on the production-sharing model and covering an area of 3,000 square kilometres. "We are preparing to become an energy hub as everybody knows we have a fantastic geographical location between the Red Sea and the Mediterranean," said El Molla. "We also have important infrastructure, the Suez Canal, LNG plants in Damietta and Port Said, refineries on two coasts and the Sumed pipeline running from the Gulf of Suez to offshore Alexandria," he explained. "For example, we've signed agreements with Cyprus to bring their gas here, whether for our domestic use or to export on their behalf through our LNG facilities. There's an opportunity to do the same with any other gas in the Eastern Mediterranean basin," added the minister. The start of production at the Zohr field by Italian energy company Eni in 2016 transformed the country from being an importer to again being an exporter. As regards its import facilities in the form of two floating storage and

regasification units (FSRUs) deployed at the port of Ain Sokhna in the Gulf of Suez, one FSRU would continue to be in operation for strategic reasons. "The regasification plant, which is the FSRU standing at Ain Sokhna, is going to be there for strategic reasons but on idle mode," he added.

ENGIE, the French utility Engie, the parent company of France's network operator and LNG terminals owner, said its US\$8.6 billion joint bid with a Canadian fund won the competitive tender conducted by Brazilian energy company Petrobras for the sale of the South American nation's largest gas transmission network. Engie and its partner now own 90 percent of Transportadora Associada de Gas (TAG) whose assets consists of 4,500 kilometres of gas pipelines in Brazil, around 47 percent of the country's entire gas infrastructure. The winning bid was made by Engie in conjunction with the CDPQ pension fund company of the Canadian province of Quebec, a leading investor in infrastructure. Engie controls GRTgaz, the French natural gas pipeline network operator whose subsidiary Elengy operates three LNG import terminals, Fos Tonkin, Fos Cavaou and Montoir-de-Bretagne. Engie's total net ownership of Brazil's TAG will amount to 49.3 percent of the company with most of the balance held by CDPQ and 10 percent retained by Petrobras. The French utility said after completing the transaction it expected its total net debts to increase by 1.6 billion euros (\$1.8Bn). "In addition to its ownership, Engie will be the industrial partner for TAG, managing the asset after the closing of the transaction and taking 100 percent of the operations and maintenance after the third year," explained Engie.

The company said its acquisition of TAG was aligned with its strategy to be leader of the zero carbon-transition of which natural gas is included. "This transition requires sophisticated large-scale energy infrastructure such as the TAG pipeline network," said Engie. "Natural gas will increasingly contribute to the diversification and decarbonization of Brazil's energy mix, replacing high-carbon energy sources while complementing renewable generation," added the French company. Engie said that the acquisition was also in line with its objective to rebalance the geographic and regulatory exposures of its network activities and to benefit from the steadily

growing Brazilian gas market. "TAG will provide Engie with revenues based on long-term contracts and the opportunity to broaden its local customer portfolio and develop new uses for gas transportation networks," it added. The transaction is expected to close before the end of the first half of 2019 and is conditional on the approval of the relevant anti-trust and competition authorities in Brazil and the European Union.

ENN ENERGY Holdings Chief Executive Zhang Yesheng said the company would be expanding its LNG and natural gas activities, including constructing new pipelines in eastern Zhejiang province and city-gas connections elsewhere as annual profits increased along with revenues. The ENN CEO said the Zhoushan LNG import terminal, the first privately-owned LNG facility in the country, had received 300,000 tonnes of deliveries since it started commercial operations in October 2018 and would be expanding. "Construction of more pipelines from the Zhoushan LNG receiving terminal will start this year. The first phase of the receiving terminal has a handling capacity of 3 million tonnes and will expand to 10 million tonnes in 2022," said ENN CEO Zhang in a presentation of the company's annual earnings and strategy. "Zhoushan is China's first large LNG receiving terminal financed by a private enterprise. It serves as an important hub for connecting the domestic market and international resources," added the CEO. He said that ENN's annual retail natural gas sales had risen by 20 percent to 17.37 billion cubic metres, the equivalent of 12.8 million tonnes of LNG. The company's core profits from pipeline natural gas, city-gas supplies and a growing gas-fuel business for vehicles increased during the year to 4.47 billion yuan (\$665 million), up 19.8 percent compared with the previous year's 3.73Bln yuan of profits.

Total annual revenues posted by ENN rose 25.7 percent in 2018 to \$60.69Bln yuan (\$9Bln) versus 48.26Bln yuan in 2017. "ENN is continuing to expand its city-gas concessions and was concentrating more in the economically well-developed coastal areas, with strong customer affordability," said Zhang. At the start of 2019, ENN said it had 187 city-gas supply areas under its management. It was also improving its city-gas concessions to cover surrounding areas through pipeline extensions. Zhang said the LNG terminal would enable a

broadening of the LNG value chain in Zhejiang province and elsewhere with LNG unloading, storage, send-out, sea and river intermodal transportation and LNG bunkering. "Backed by the Yangtze River Delta market, along with its shoreline, sea route and access to inland provinces, the LNG terminal has a great location advantage," added the CEO. "LNG trading will develop further in the direction of larger volumes, shorter contracts, more flexible trades and lower prices in the coming years. Global LNG trade volumes are also projected to reach more than 500 Bcm by 2023," stated Zhang.

FLUXYS LNG, the operator of the Zeebrugge import terminal in Belgium, said it intended to launch a subscription window in the second half of April for unloading slots and additional storage services at the facility. Fluxys said Zeebrugge offered its customers optimum destination flexibility, including direct access to the markets of Belgium, fully interconnected with the gas systems of all surrounding markets such as those in France, the Netherlands and the UK and take-away capacity from the terminal is readily available. "The subscription window is a highly attractive opportunity for companies to secure LNG terminalling capacity with an experienced provider at a key strategic location providing optimum destination flexibility," said Fluxys. The Zeebrugge facility has operated since 1987 and its tariffs are regarded as among the most competitive in Northwest Europe. It is also one of the terminals that perform trans-shipments of LNG cargoes from ice-class carriers from the Russian Yamal liquefaction and export plant in Northern Siberia. Fluxys is currently building a fifth LNG storage tank with a capacity of 180,000 cubic metres and additional process installations.

The construction is expected to be completed by mid-2019 and will further support its trans-shipment of cargoes under its contract with Yamal LNG Trading. "Capacity at the Zeebrugge terminal is highly attractive because gas import needs in Northwest Europe are set to rise significantly," said Fluxys. "While gas production in The Netherlands and the North Sea is declining, gas demand for power generation will increase to accommodate the phase-out of sizeable coal, lignite and nuclear power generation capacity in the region," it added. "The Zeebrugge terminal ticks all the boxes for

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LNG companies who are keen to close the forthcoming supply-demand gap in Northwest Europe,” stated the Belgian company. Fluxys noted that Zeebrugge was recognized as a versatile facility, able to handle LNG ships of any type and size for loading or unloading. The terminal also serves as a hub for small-scale vessels as well as LNG truck-loading. Fluxys has invested in a second truck-loading station, doubling the capacity from 4,000 to 8,000 truck-loadings per annum in 2019.

GAZPROM said it finalized the configuration of its planned new Russian liquefaction and export plant proposed for the port of Ust-Luga on the Baltic Coast and has increased the volume of production. The Baltic LNG concept proposes the design, construction and operation of an LNG production plant on the coast about 110 kilometres from Saint Petersburg. The facility would be located in the port of Ust-Luga and have capacity of 13 million tonnes per annum of LNG instead of the original capacity estimate of 10 MTPA. Gazprom and RusGazDobycha, a special purposes company securing gas supplies for the chemicals industry, said they envisage construction of capacities for the processing of 45 billion cubic metres of gas. The plant would additionally produce 4 million tonnes per annum of ethane for the chemicals industry and over 2.2 million tonnes of liquefied petroleum gases (LPG) per annum. “The complex will be processing ethane-containing gas produced by Gazprom from the Achimov and Valanginian fields of the Nadym-Pur-Taz region,” said a Gazprom statement. “The gas remaining after the processing (about 20 billion cubic metres) will go into the company's domestic gas transmission system,” added Gazprom. Gazprom and RusGazDobycha said they expected to put the first LNG Train of the complex into operation in the second half of 2023 and the second Train in late 2024. The project operator will be RusKhimAlyans, another special-purpose company established on a parity basis by Gazprom and RusGazDobycha. The operator's priorities include the development of basic and detailed design documentation and the launch of land planning activities at the leased site of 1,400 hectares in the southern part of Ust-Luga port.

“It is also planned to devise contracting arrangements within the project, designate engineering, procurement and construction contractors and place orders

for long lead items,” Gazprom added. “The plant will make it possible to increase Russian LNG exports and to take LPG exports up by 30-40 percent,” it said. “The production of ethane, which is in high demand in the domestic industry, will also grow substantially. The ethane produced at the plant is to be supplied to a chemical facility whose construction is to be independently sponsored by RusGazDobycha and known as the Baltic Chemical Complex,” stated Gazprom. “The decision is a practical manifestation of the new economic model for the comprehensive monetization of hydrocarbon resources,” said Alexey Miller, Chairman of Gazprom. “Combining the production of LNG and ethane within one industrial site will have a beneficial effect on the economics and specific indicators of the project and will allow us to considerably mitigate our resource and price risks,” added Miller. A possible overseas partner in the project is Japanese trading house Mitsui & Co., a stakeholder in Gazprom’s Sakhalin LNG plant in the Russian Far East currently producing around 10 MTPA of LNG. Gazprom Chairman Miller held a meeting in Moscow in January 2019 with his Mitsui counterpart Masami Iijima at which the Baltic LNG project was discussed. Gazprom and Mitsui signed a memorandum of understanding in 2018 on the Baltic project, which they said would also include LNG bunkering facilities. Mitsui is also a shareholder in US LNG capacity through its stake in Semptra Energy’s Cameron LNG in Louisiana.

HUDONG-ZHONGHUA, the owner of the largest Chinese shipyards, said it was planning to construct the world’s largest liquefied natural gas carrier with a capacity of 270,000 cubic metres. Chinese newbuild is larger than the current biggest vessel, the Q-Max series of tankers owned by Qatar with capacities of around 266,000 cubic metres. Hudong-Zhonghua said it was working on the project with other parties, including the Norway-based European classification society DNV GL. The Chinese shipbuilder’s main construction yards are in the ports of Nantong and Shanghai, where Hudong-Zhonghua also has its headquarters. Under the agreement, research and development work on the 270,000 cubic metres capacity vessel is set to be completed by the end of 2020. “The two sides decided to go in for a super-sized LNG carrier to account for the

increasing clean fuel demand in China,” said the Chinese company. “Other reasons for using large-sized carriers was the limited number of LNG terminals in China's coastal cities and long-haul voyages,” it added. Hudong-Zhonghua, a subsidiary of state-run China State Shipbuilding Corp., said the largest LNG vessel would carry natural gas in one voyage that could supply gas-fired power for 4.7 million households in Shanghai for a month.

So far South Korean shipyards have specialized in constructing the super-sized LNG vessels, the Qatari Q-Flex and Q-Max tankers with between 210,000 cubic metres and 266,000 cubic metres of capacity. Between 2004 and 2007, Qatar ordered 45 LNG carriers from the Korean yards when Daewoo ShipBuilding and Marine Engineering built 19 of the larger Qatari carriers, Samsung Heavy Industries constructed 18 vessels and Hyundai Heavy Industries received orders for eight of the ships. The Qataris are in the midst of expansion plans for four new LNG processing Trains and are likely to order at least 30 more super-sized carriers. Up until now Hudong-Zhonghua’s largest LNG carrier design has been for a vessel with 174,000 cubic metres capacity. The American Bureau of Shipping, the US classification society, granted approval for such a vessel in September 2018. The 174,000 cubic metres capacity China-built carrier will have Mark III Flex storage tanks designed by French technology company GTT.

JERA CO Inc., the largest Japanese liquefied natural gas buyer and power assets owner, said it was overhauling its business while increasing its medium-term LNG activities with a larger carrier fleet as it aimed for 3.6 trillion yen (\$33 billion) of sales in fiscal 2019. The company said it now had volumes of LNG amounting to 35 million tonnes per annum, upstream investments in five projects and was increasing its LNG fleet from 18 vessels to 25 to ship its cargoes. However, while LNG activities would focus on growth through 2030, after that date Japan’s needs for power generation could be different. For its power generation arm of Tokyo Electric Power and Chubu Electric, JERA controls domestic power capacity of 67 gigawatts and a total of nine gigawatts of overseas output. JERA said the direction was uncertain for Japan’s future power mix, though by 2030 it could have 20-22

percent nuclear power units in operation, 24-22 percent made up of renewable energy projects, 27 percent gas-fired plants supplied with regasified LNG, 26 percent coal-fired plants and 3 percent oil-fired plants. Under the transition, Japan could replace more plants requiring LNG with renewable projects than other generating facilities, leading to a possible future decrease in LNG imports of around 14 percent after 2030. The 2030 energy mix numbers differ significantly from the 2016 figures of 16 percent nuclear, 41 percent gas-fired plants using LNG, 33 percent coal and 10 percent oil. “Population shrinkage and sluggish demand means that a constant growth of domestic demand for electricity can’t be expected in the future,” according to JERA. Its figures suggest the Japanese population could drop to 93 million people by 2060 from 128 million at present. JERA explained that its company structure would now comprise three separate departments overseeing the five main sectors of its business, fuel markets, fuel procurement, power plants, electricity sales and the domestic electricity market. JERA said the role of its “Optimization Department” would assume greater importance in the future.

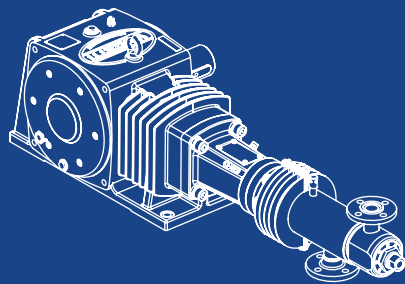
“It will be responsible for increasing profits through operational excellence in power plants and fuel terminals, as well as market trading of fuel, electricity and gas, based on the existing agreements,” said the company. The company’s “Business Development Department” would also have a key role. “It would increase returns by achieving the optimal asset portfolio through new installations and the replacement and restructuring of power plants,” added the company. JERA’s “Operations & Maintenance Department” would be responsible for boosting returns by achieving high value-added services through “agile operations and cost reductions” in utilizing its infrastructure. The company said it would use LNG and renewables to spark the transition to a clean-energy economy up to 2025. “Through enhancing the LNG value chain and undertaking large-scale renewable energy development and constructing a complementary relationship between LNG-fired power and renewables, JERA will provide stable, economic and clean energy,” stated the company. JERA said it would also implement “six measures” to achieve its strategy goals and to be a world leader in LNG and renewables. “For LNG, we would maintain and expand our fuel procurement scale through



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replacement of domestic power plants with more efficient facilities and with expansion of generation,” it explained. “We would leverage that scale for LNG trading expansion and upstream project participation and improve profitability along the entire value chain,” JERA added. “For renewable energy, we would leverage our large-scale project development competence that we gained from the existing projects, promote development focusing on offshore wind power in particular, and grow it as one of the main pillars of the business in our future portfolio,” stated the company.

KBR, the US energy engineering company, was awarded the preliminary front-end engineering contract by BP of the UK for the second and third phases of the Tortue natural gas project being pursued with Kosmos Energy of the US that will underpin floating LNG production on the maritime border between the West African nations of Senegal and Mauritania. The first gas from the Kosmos-BP floating LNG Train 1 is scheduled for 2021 and the start of a second FLNG Train is set for 2023. KBR had already been awarded the front-end engineering and design contract for the first phase of the Tortue natural gas field development. BP and Dallas, Texas-based Kosmos have estimated that the Tortue field has resources for LNG production of around 25 trillion cubic feet of feed-gas and an additional 15 Tcf is contained in nearby fields. “These next phases of the Greater Tortue-Ahmeyim project will significantly expand capacity to deliver additional gas from an ultra deep-water subsea system, tied back to mid-water gas processing platforms,” said KBR in describing its latest award. “The gas will then be transferred to pre-treatment and offshore LNG facilities located at the established Phase 1 hub,” added the US company.

KBR said it was determined and honored to bring LNG revenues and gas to Africa for decades to come. “This win demonstrates KBR's strategic commitment to our partner BP to deliver an innovative and cost-effective deepwater gas value chain together,” said Jay Ibrahim, KBR's President for Energy Solutions. The subsea contracts were awarded in March 2019 to McDermott International and Baker Hughes-GE, the US energy services companies. The initial subsea infrastructure supplied will connect the first four of 12 wells consolidated through production pipelines

leading to a floating production, storage, and offloading (FPSO) vessel. From here liquids are removed and the export gas is transported via a pipeline to the FLNG production hulls where the gas is liquefied. McDermott and BH-GE said their contract followed an initial front-end engineering and design phase awarded in March 2018 when both companies worked together to define the technology and equipment scope for a four-well development.

KBR, the US energy and LNG engineering company, has selected Baker Hughes-GE to supply gas turbine driver technologies for the ongoing development of KBR's standardized design for a mid-scale LNG liquefaction plant. The KBR design also utilizes the Optimized Cascade technology system owned by ConocoPhillips to liquefy the feed-gas. “The mid-scale LNG facilities designed under the agreement between KBR and BHGE will standardize around BH-GE's proven gas turbine driver technologies, featuring BH-GE's LM2500+G5 and LM6000PF gas turbines,” said KBR. “KBR and BH-GE will leverage their unique experiences and service portfolios to provide standardized, low-capital expenditure LNG solutions for grassroots and existing LNG assets,” they added.

Farhan Mujib, KBR President of Hydrocarbons and Delivery Solutions, pointed out that both companies have cooperated in the past, before the GE Oil & Gas driver provider merged with Baker Hughes to expand their oil services offerings. “BH-GE and KBR have a well-established 40-year history and partnership successfully delivering LNG projects,” explained Mujib. “This allows us to further enhance our cost-effective standardized approach to LNG design, minimizing Capex and operating expenses for our clients,” he added. Rod Christie, President and Chief Executive of Turbomachinery Process & Solutions at GE, said he was pleased with the new tie-up on gas turbine technology. “We welcome the opportunity to strategically work together with key partners like KBR, looking at our collective solutions across the value chain to develop a more competitive solution,” added Christie.

KBR, the US energy and LNG engineering company, said it was awarded a contract by Toronto-listed Pieridae Energy for a two-Train export facility at Goldboro in the Canadian Atlantic Coast province of Nova Scotia as the German-

backed venture moves closer to its final investment decision. Under the terms of the contract, KBR will perform a review of an amended version of the previously prepared front-end engineering and design study for the proposed Goldboro liquefaction facility, KBR will also conduct an “open-book estimate” necessary for an engineering, procurement, construction, and commissioning contract for the Goldboro facility with the intention of entering into an engineering, procurement and construction contract by the time the final investment decision is taken. The US company said contract work on the project, backed by German utility Uniper, is expected to be performed within 11 months. Pieridae has signed a 20-year sales agreement with Uniper which the Canadian company said was worth around C\$35 billion (US\$26.3Bln) over the life of the project. “The German Government is supportive of the project, declaring it eligible in principle for up to US\$4.5 billion in loan guarantees,” added Pieridae in giving the KBR contract details.

The Calgary-based company, headed by Chief Executive Alfred Sorensen, is on the venture list of the Toronto Stock Exchange for small commodities companies. Pieridae also owns natural gas assets in the Alberta Foothills in the central Canadian province. “We are extremely pleased with this development as it marks a major step in getting the Goldboro LNG facility built,” said CEO Sorensen. “This is Eastern Canada's only fully permitted LNG facility with gas supplies, a pipeline route and an anchor customer,” he added. KBR said it was excited to be a part of this “significant project” with Pieridae and to continue to grow and maintain a substantial presence in the Eastern Canadian Region. “This win is indicative of KBR's strategic commitment to increase LNG production globally, supporting the transition to a lower carbon economy,” said Farhan Mujib, KBR President for Hydrocarbons and Delivery Solutions. “We are looking forward to a close and collaborative relationship with Pieridae to successfully deliver their LNG facility,” added Mujib.

MITSUBISHI Heavy Industries, the Japanese supplier of turbines and compressors for the liquefied natural gas industry, has signed an agreement to provide its equipment to the onshore Rovuma liquefaction plant joint venture in Mozambique in southeast Africa. The main shareholders in the Rovuma project

are Italian energy company Eni and US major ExxonMobil through their stakes in the Area 4 licence offshore Mozambique. ExxonMobil is leading the building of the liquefaction plant and LNG operations on behalf of the Area 4 joint venture, while Eni will be in charge of the bringing on stream of the upstream facilities. The development plan for the first phase of the Rovuma LNG project specifies the proposed design and construction of two LNG Trains, which will each produce 7.6 million tonnes per annum of LNG in the first phase. Mitsubishi said it was supplying its H-100 gas turbine and compressor packages for the phase one of Rovuma LNG. “Subject to final investment decision on the project, Mitsubishi Heavy Industries Compressor Corporation (MCO) will supply the main liquefaction compressors and Mitsubishi Hitachi Power Systems (MHPS) will provide dual-shaft, 120 megawatt H-100 gas turbines as the mechanical drivers,” said the Japanese company.

The Rovuma project also plans to utilize the AP-X liquefaction process from the US equipment and technology company Air Products in the proposed plant in Mozambique's northern area. “We are pleased that ExxonMobil and their partners were the first to select MHI's H-100 driven compressor trains for their Rovuma LNG project and anticipate future uses for the flexible turbine design,” said Mitsubishi President and Chief Executive Seiji Izumisawa. “This project will allow us to demonstrate the benefits of MHI's LNG solution in terms of lower production costs, increased productivity, reduced complexity and lower lifecycle costs, while significantly reducing plant emissions,” added Izumisawa. The Rovuma Basin Area 4 project participants in addition to Eni and ExxonMobil include China National Petroleum Corp., Korea Gas Corp., Portuguese oil and gas company Galp Energia and Mozambican state energy company Empresa Nacional de Hidrocarbonetos. Mitsubishi said its H-100 was ideally suited as a main refrigeration compressor driver for large-scale LNG plants with any liquefaction process. “The H-100 gas turbine's high availability, robust and simple industrial design requiring no external helper motor or intercooler, contributes to footprint and space savings,” added the company.

NEXTDECADE Corp., the developer of the Rio Grande LNG export project at the port of Brownsville in Texas,



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announced at the LNG2019 conference in Shanghai that it had signed a 20-year sale and purchase agreement with Royal Dutch Shell. Shell will purchase LNG on a free-on-board basis whereby it provides its own shipping starting from the commercial operation date of Rio Grande LNG, currently expected in 2023. The US company announced the key event at its exhibition stand at the LNG19 conference in the Chinese city backed by the International Gas Union (IGU) and Gas Technology Institute. NextDecade said that around three-quarters of the purchased LNG volumes will be indexed to the North Sea Brent crude price and the remaining volumes indexed to US natural gas prices, including the benchmark Henry Hub. “The SPA is the first-ever long-term contract with LNG produced out of the United States to be indexed to Brent and comes with full destination flexibility,” stated NextDecade. “We are thrilled that we continue to achieve our milestones, as promised, and look forward to finalizing additional commercial agreements and to proceeding with the development of our Rio Grande LNG project,” added the company. Matt Schatzman, NextDecade’s President and Chief Executive and a former executive with BG Group of the UK, said he was honoured to have Shell as the first foundation customer.

“Shell is not only the largest portfolio LNG company in the world, Shell is also a recognized pioneer in the global LNG business,” explained Schatzman. “Shell was the first to sign a long-term SPA from the United States indexed to Henry Hub in 2011, and so it is fitting they are the first to sign a long-term SPA from a US LNG project indexed to Brent,” added Matt Schatzman. Shell also welcomes the deal with Slavko Preocanin, Vice President of Shell LNG Marketing & Trading saying the deal secured more volumes for the Anglo-Dutch company for the 2020s. “It ensures we can meet the growing demand for secure, flexible and cleaner energy from our global customers,” added Preocanin. “We look forward to working with NextDecade in the years to come,” he added. NextDecade said it anticipated making a positive final investment decision by the third quarter of 2019 on up to three LNG Trains in its first phase of development. The Brownsville plant will produce around 27 MTPA of LNG and the company’s affiliated Rio Bravo Pipeline in South Texas is also being approved. NextDecade has a second Texan export venture called

Galveston Bay LNG. Galveston Bay LNG will include a 97-mile affiliated pipeline to move 3 billion cubic feet of natural gas per day from the Katy Hub in Waller County, while the liquefaction plant is proposed for a 550-acre site along the Texas City Ship Channel.

NOBLE ENERGY, the US exploration and production company with overseas interests in the East Mediterranean and West Africa, has approved the Alen natural gas development offshore Equatorial Guinea to provide feed-gas for the LNG export plant. “Natural gas from the Alen field will be processed through the existing Alba liquefied petroleum gas processing plant (Alba Plant) and EG LNG’s production facility at Punta Europa on Bioko Island,” said Noble. “Definitive agreements in support of the project were executed between the Alen field partners, the Alba Plant and EG LNG plant owners, as well as the government of Equatorial Guinea,” added the US company. J. Keith Elliott, Noble Energy’s Senior Vice President for offshore activities said the Houston, Texas-based company was excited to announce this high-return, capital-efficient development as its next major offshore project. “First EG production is anticipated in the first half of 2021,” said Elliott. He said the West African gas field is next on Noble’s agenda as it moves to complete its development of the world-class Leviathan gas field in the East Med offshore Israel. “The Alen development is the first step towards creating an offshore natural gas hub in EG, which will open the potential for future monetization of additional discovered resources through existing infrastructure,” explained Elliott. “Noble has discovered three trillion cubic feet of gross natural gas resources in the Douala Basin, which positions us well for LNG sales exposure over the coming decade,” stated Elliott. The Alen field initially commenced operation in 2013 as a condensate production and natural gas recycling project. Natural gas from the field has been produced and reinjected into the reservoir to support the enhanced recovery of liquids since start-up. Primary condensate will continue to be produced and transported to the Aseng field production, storage and offloading vessel for sales. Noble explained that the Alen gas monetization project will utilize the existing three high-capacity production wells on the platform, with minor modifications necessary to deliver sales

gas from the platform to the Alba Plant and EG LNG facilities.

Noble said a 24-inch pipeline capable of handling 950 million cubic feet of natural gas equivalent per day will be constructed to transport all natural gas processed through the Alen platform approximately 70 kilometres to the Bioko Island facilities. At start-up, natural gas sales from the Alen field are anticipated to be between 200 and 300 million cubic feet per day (75 to 115 MMcfe/d net to Noble). “The wet gas stream will be tolled through the Alba Plant for additional liquids recovery before converting dry gas into LNG via the EG LNG facility,” stated the US company. Noble anticipates that Alen natural gas sales will grow modestly as open capacity in the EG LNG plant increases due to declining Alba field production. Noble said it would maintain ownership of the hydrocarbons through the processing facilities, and the company will be progressing negotiations for offtake agreements to sell the LNG in global markets. Total estimated gross recoverable resources from the Alen field are around 600 billion cubic feet of natural gas equivalent. Gross capital expenditures for the development are estimated to be \$330 million. The Alen field is located on Block O (95 percent) and Block I (5 percent) offshore EG. Noble operates the Alen field and holds a 45 percent working interest in the project (45 percent Block O and 38 percent Block I). Other Block O interest owners include commodities and energy company Glencore with 25 percent and the EG company GEPetrol with the remaining 30 percent. Other Block I interest owners include Glencore with 23.75 percent, Atlas with 27.55 percent, GEPetrol with 5 percent and commodities firm Gunvor with the remaining 5.7 percent. Noble Energy holds a 28 percent working interest in the Alba Plant which is operated by Marathon Oil Corp. of the US. The EG LNG facility is also operated by Marathon, though Noble has no working interest in the LNG plant.

PAPUA NEW GUINEA and energy companies, including liquefied natural gas plant operator ExxonMobil, have signed a formal Gas Agreement with the government defining the fiscal framework for the Papua expansion project. The PNG LNG plant, located northwest of Port Moresby, already produces around 8 million tonnes per annum of LNG and studies have supported new LNG capacity comprising three Trains each

with 2.7 MTPA of output and the upstream development of the Elk-Antelope field to provide feed-gas. The other signatories to the agreement with the government are French major Total and Australian-listed Oil Search, the main shareholders in the Petroleum Retention Licence 15 that will underpin most of the production increase at the plant. The agreement gives the PNG Government and landowners 22.5 percent of the project with Total holding 31.1 percent, ExxonMobil 28.7 percent and Oil Search 17.7 percent. “We believe the fiscal and other terms of the Gas Agreement equitably allocate Project benefits and returns to the State, the project participants and other stakeholders,” said Oil Search Managing Director Peter Botten. The agreement includes a domestic market obligation to provide gas for sustainable future domestic usage. Oil Search and the other companies said they were highly supportive of increased use of gas within PNG to assist in building local industry as well as the generation of power. The accord additionally includes a deferred payment mechanism for the State to meet past costs, easing the financial burden associated with the PNG Government’s acquisition of its equity interest in the project.

“We are very pleased with the progress of this competitive LNG project that benefits from the brownfield synergies with existing liquefaction facilities and the proximity to Asian markets,” said Patrick Pouyanne, Chairman and Chief Executive of Total. Total operates the Elk and Antelope onshore fields that will provide two of the Trains in the three-Train expansion with their feed-gas. There is also a national content section in the gas agreement that supports local workforce development, involvement of local businesses and socio-economic development of the communities impacted by the expansion project. “The signing of this important agreement will allow all Papua LNG project parties to proceed with confidence into front-end engineering and design-related activities, commencing with contractor selection and engineering contracting,” said the companies. “In addition, the PRL 15 joint venture has reached alignment on a suite of agreements which will support the Papua LNG project taking the next step towards development, including those related to the PNG LNG project site and facility access,” they explained. The Papua Gas Agreement is for the PRL 15 stakeholders and a second accord for the



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PRL 3 asset owners has still to be signed. Oil Search said its focus would now move to working with PRL 3 operator, ExxonMobil, and the government to close out an agreement for the development of the additional P'nyang gas field and the commencement of the FEED phase for the proposed three-Train integrated development at the PNG plant. This will also include a front-end engineering agreement for the Associated Gas Expansion project, operated by Oil Search. When this deal is signed the way will be open for a final investment decision to be taken in 2020, ensuring that first production from the expansion is available to world LNG markets in 2024.

QATAR has said that qualified shipyards in South Korea were being invited to participate in a tender for the provision of newbuild slots for dozens of LNG carriers required for the expansion of the Gulf nation's North Field resources and the building of up to four new processing Trains. The Qataris are also preparing to seek contractors during the second quarter of 2019 for the engineering, procurement and construction of the onshore facilities at Ras Laffan after the front-end engineering and design phase of the expansion plan was completed by Japanese energy engineers Chiyoda Corp. Analysts expected that South Korean shipbuilders could receive orders for between 30 and 40 new LNG carriers. Korean shipyard executives were previously sounded out by Qatar Petroleum executives on freeing up berths over the next 12 months for a wave of Qatari LNG newbuilds. Samsung Heavy Industry, Hyundai Heavy Industries and Daewoo Shipbuilding & Marine Engineering are set to receive orders, even as Hyundai and Daewoo may eventually merge under a Korean shipyard consolidation plan. The Korean yards specialize in constructing the Qatari Q-Flex and Q-Max tanker with

between 210,000 cubic metres and 266,000 cubic metres capacity. A South Korean government spokesman said that the Qataris had outlined their LNG carrier building plans at the start of 2019 during a bilateral summit in Seoul. Between 2004 and 2007, Qatar ordered 45 LNG carriers from the Korean yards when Daewoo built 19 Qatari carriers, Samsung constructed 18 vessels and Hyundai received orders for eight ships.

The Qataris are also in talks with global oil majors about selling partnerships in the additional four liquefaction Trains being planned to boost production by 40 percent. The scope of the expansion at the Ras Laffan production complex involves an additional three liquefaction Trains, each with 7.8 million tonnes per annum of output and with pre-investment to add a fourth new Train soon after. This would take nameplate output up to 108.2 MTPA from 77 MTPA when the four Trains at Ras Laffan are completed by 2023 and 2024. The Qatari expansion by 31 MTPA amounts to more in volume than the LNG currently produced by nations such as Malaysia, Indonesia and Nigeria, hence the large shipping requirements. Qatar's foreign shareholders in the existing LNG Trains are ExxonMobil, the largest with stakes in 10 Trains, French major Total with shares in three Trains and Royal Dutch Shell and ConocoPhillips, each with a stake in one Train. Other holders of small stakes in Qatar LNG Trains include foundation customers, including the Japanese trading houses, Marubeni Corp, Mitsui & Co. and Itochu Corp., as well as Korea Gas Corp. All are expected to express interest in the tenders set to be launched by Qatar for potential shareholders in the Ras Laffan expansion, along with possible newcomers such as Chevron Corp., Equinor of Norway, Italy's Eni and Far East national oil companies. Qatar's new onshore facilities will receive about 4.6 billion standard cubic feet per day of feed gas from the southern sector of Qatar's

North Field gas reserves in the Gulf. Qatar has the southern portion of the North Field and the other part is under the jurisdiction of Gulf neighbour Iran.

QATAR Petroleum and ExxonMobil said their joint marketing company Ocean LNG, created in 2016, would be responsible for placing all of the offtake from the Golden Pass liquefaction and export plant being developed on the Gulf Coast of Texas. Ocean LNG is an international joint venture marketing company started in October 2016 in which Qatar Petroleum owns 70 percent and ExxonMobil holds 30 percent. "Ocean LNG will be prominently featured for the first time as part of the Qatar Petroleum pavilion at the global industry event, LNG 19, being held in Shanghai," said Qatar Petroleum. "Since its establishment, Ocean LNG has been active mainly in South America and Europe," noted Qatar Petroleum. "Following a successful Final Investment Decision of Golden Pass LNG on 5 February 2019, Ocean LNG will now focus its efforts on marketing its US LNG volumes in the Asia Pacific region through further extensive engagements," explained the company. The marketing unit would seek to expand its relations and networks with both established customers as well as emerging and prospective LNG buyers.

"The FID of Golden Pass LNG earlier this year underpins Ocean LNG's marketing efforts to deliver US LNG to customers across the globe," said Saad Sherida Al-Kaabi, Qatar's Minister of State for Energy Affairs, and President and Chief Executive of Qatar Petroleum. "This is a further testament of Qatar Petroleum's position as a global LNG leader with a large portfolio capable of offering tailored LNG supply structures and commercial terms in an evolving global LNG environment," stated Al-Kaabi. The existing Golden Pass facility, located on the Sabine-Neches Waterway in Texas, is majority owned by Qatar and with ExxonMobil holding 30 percent of the venture. Originally designed as an import facility before the shale-gas revolution, Golden Pass will be reconfigured at a cost of more than \$10 billion to export up to 15.6 million tonnes per annum of LNG. Golden Pass has already received all necessary regulatory approvals from both the US Federal Energy Regulatory Commission and the Department of Energy. An engineering consortium comprising McDermott and

Zachry Group of the US and Japan's Chiyoda Corp. have been awarded the contract to build the plant.

SEMPRA ENERGY, the developer of two US export projects and a third in Mexico, said it received authorizations from the US Department of Energy to export US-produced pipeline natural gas to Mexico and to re-export it as LNG to countries that do not have a free-trade agreement with the US. Semptra is set to start operations soon from its Cameron plant in Hackberry in Louisiana and is developing its two other projects, the Port Arthur facility in Jefferson County in Texas and its Costa Azul export venture on the Pacific Coast of Mexico. "The timing of these approvals is great news as we meet with customers and partners this week in Shanghai," said Joseph A. Householder, President and Chief Operating Officer of Semptra in reference to the LNG19 global industry conference taking place from April 1 to April 5 in the Chinese city. The Costa Azul facility was the first LNG import terminal constructed in 2018 on North America's West Coast and is located about 15 miles north of Ensenada in the Mexican state of Baja California. Costa Azul is now being transformed into an export plant in two phases and requires US DOE permits to receive its cross-border feed-gas and to then re-export the volumes to third countries. The first part of the transformation of the Mexican plant will see the construction of a single liquefaction Train to be located adjacent to the existing terminal and with capacity for 2.4 MTPA of exports. Franco-US engineering company TechnipFMC and Omaha, Nebraska-based Kiewit Corp. were selected in June 2018 as the Costa Azul engineering, procurement, construction and commissioning contractors. Semptra has already found three initial buyers who have booked the full export capacity of the first phase of the liquefaction project. They are French energy major Total, Japanese trading house Mitsui & Co. and Tokyo Gas.

"Costa Azul's location on the West Coast of North America is truly a differentiator," added Householder. "It will source natural gas from some of the fastest-growing production regions in the US and provide our customers with a competitive advantage in accessing world markets, especially Asia," stated the Semptra COO. The San Diego, California-based company said the authorizations are another step forward in the

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Japan LNG Producer-Consumer
26 September 2019
Conference, Convention Center, Grand Prince Hotel New Takanawa, Tokyo, Japan
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development of this project that could bring many benefits for Mexico and US natural gas producers. The Costa Azul plant will use its current storage tanks, marine berth and associated facilities. However, the second phase of development will include the addition of two more Trains and one LNG storage tank. The DOE authorizations allow the export of 636 billion cubic feet a year of US-sourced gas from all the affiliated developments. “Phase two of the project will require additional DOE approval in order to export its full expected capacity,” added Semptra. Semptra is aiming to have a total LNG export capacity from its three plants in Louisiana, Texas and Mexico of 45 million tonnes per annum.

SOUTH KOREAN company Epik Co. has signed an agreement with Australian building contractors Watpac Ltd for the design and construction of the onshore infrastructure for the LNG import facility planned for the Australian port of Newcastle in the state of New South Wales. The Korean firm said it had also established an Australian subsidiary to carry out the project that will include the deployment of a floating storage and regasification unit. Watpac will be supported by Mott MacDonald, an international marine and engineering infrastructure consultant with significant experience in the design and engineering of multiple FSRU projects around the world. “This is a significant step forward for the Newcastle LNG project in partnering with Watpac and Mott MacDonald,” said Jee Yoon, Epik’s Managing Director. Watpac, a wholly-owned subsidiary of the Besix group, has operations across the country and has previously delivered challenging construction and marine and civil projects. In September 2018, Besix completed the design and construction of the Bahrain LNG import terminal located offshore Muharraq Island, which is anticipated to commence commercial operations in May of this year. “As an Australian company, we are thrilled to be partnering with Epik to deliver the engineering and construction services for this critical project,” said Bram Gruwez, Watpac General Manager.

The Newcastle LNG project expects to receive all its regulatory approvals for the project, by early 2020. The Korean-led LNG regasification project is the second proposed for the state of New South Wales with a venture planned for Port Kembla, south of Sydney. The developers of

Newcastle LNG pointed out that the facility would be in one of Australia’s largest ports and a major trade and logistics hub, making it an optimal area for a terminal. The potential investment for the Newcastle LNG project is estimated to be between US\$400M and US\$430M, which will include a 170,000 cubic metres capacity newbuild FSRU and associated onshore infrastructure. Epik said it expected to place an order for the FSRU with a Korean shipyard subject to receiving regulatory approvals for the project. The companies planning a terminal at Port Kembla are Australian Industrial Energy, part of the Munderoo Group, and Japan’s Marubeni Corp. and Jera Co. Inc. Port Kembla is an existing industrial cargo port with man-made breakwaters about 100 kilometres south of Sydney in the Illawarra region. The Australian state of Victoria is also planning an LNG regas project through AGL Energy to be located at Crib Point, about 90 kilometres south of Melbourne.

TELLURIAN INC. developer of the Driftwood LNG project in Louisiana backed by companies such as French energy major Total, has launched an open season for its Permian Global Access Pipeline to secure prospective customers. The Permian Global Access project is a proposed 42-inch diameter inter-state natural gas pipeline originating at the Waha Hub in Pecos County in Texas and terminating at Gillis in Louisiana, north of Lake Charles where the liquefaction plant will be constructed. The final environmental impact statement was issued by the US Federal Energy Regulatory Commission in January 2019 to develop the Driftwood liquefaction plant to produce around 27.6 million tonnes per annum of LNG. The pipeline will connect the prolific Permian Basin in Texas to the rapidly growing natural gas market in southwest Louisiana. “It will cost approximately \$3.7 billion to construct and will have the capacity to transport at least two billion cubic feet of natural gas a day,” said Tellurian. “Construction could begin as early as 2021 and the pipeline is targeted to be in service as early as 2023,” added the company. Tellurian is also developing a second pipeline venture called the Haynesville Global Access Pipeline at around the same cost. In addition to spending \$7.4Bln on the two pipelines, Tellurian is developing the liquefaction plant near Lake Charles with total investments of

around \$15.2Bln and the provision of about 15,000 jobs.

“Permian producers have recently paid \$9.00 per million British thermal units to move their natural gas away from the wellhead, reflecting the acute need for infrastructure development in the Basin,” said Tellurian Chief Executive and President Meg Gentle. “By contrast, Southwest Louisiana is a market expected to grow 300 percent in the next five years,” added Gentle. “The Permian Global Access Pipeline is critical infrastructure that will interconnect stranded Permian gas production with growing markets, reduce flaring and provide a valuable cleaner fuel to reduce urban pollution and carbon globally,” stated the CEO. The open season was scheduled to begin at noon Central time on April 8 and runs to Friday, May 24. Tellurian said it would encourage interested parties to contact Joey Mahmoud, President of the Permian Global Access Pipeline project, at the pipeline company website. The pipeline open season follows recent advances in the LNG project with Total signing two accords to invest more in the development company and to take its supply requirements from the venture to 2.5 MTPA of LNG. The sales agreement will be for the purchase of free-on-board (FOB) whereby Total supplies the shipping and for a minimum term of 15 years and based on the Platts Japan Korea Marker (JKM) price. Total’s equity agreement gives the French company an additional 20 million shares of Tellurian common stock for an amount of \$200 million, adding to its previous investment.

TOKYO GAS, the utility and importer of more than 12 million tonnes per annum of LNG to Japan, said it signed a preliminary LNG supply accord with the Singapore trading office of Royal Dutch Shell for the supply of cargoes at prices linked to the coal market. The Japanese company said the accord was in the form of a heads of agreement with the Shell subsidiary, Shell Eastern Trading, and could later become a firm contract. “For the past three years, Shell Eastern Trading and Tokyo Gas have been engaging in joint discussions to consider a new type of LNG agreement that can contribute to creating LNG demand,” said the utility. “As a result, for the first time among the two companies, Shell and Tokyo Gas have come up with an innovative pricing formula that is based on coal indexation and included this in

the agreement,” explained Tokyo Gas. “Under the agreement, Royal Dutch Shell supplies LNG to Tokyo Gas from the Shell Group’s global LNG portfolio, rather than from specific LNG projects,” it added. Tokyo Gas noted that it received Japan’s first-ever LNG cargo on November 4th 1969 and this year marks the 50th anniversary. Tokyo Gas is one of the world’s most experienced LNG and city-gas distribution companies and has long-term contracts with 11 projects in six countries, Australia, Malaysia, Indonesia, Brunei Russia and Qatar. The Tokyo Gas network includes three large LNG import terminals to serve the Tokyo metropolitan area as well as storage and gas-fired power plants. Japan is also a big importer of thermal coal for power generation and in 2018 it received shipments of 113.5 million tonnes of coal compared with 82.8MT of LNG.

Shell Executive Vice President Steve Hill said he was delighted to have Tokyo Gas as a partner and “offering this innovative solution” to meet their energy needs. “Our broad portfolio enables us to provide reliable LNG supply as well as tailored solutions including flexible contract terms under a variety of pricing indices,” added Hill. Tokyo Gas Managing Executive Officer Kentaro Kimoto agreed that the deal was innovative. “With our long-term relationship and joint consideration, we were able to achieve an innovative agreement that would enhance further diversification of price indexation pursued by Tokyo Gas,” said Kimoto. “We will continue to tackle new challenges that would contribute to the development of the LNG industry,” he added. Neither Tokyo Gas nor Shell gave any details of how the coal indexation price formula would be applied to LNG shipments. Another recent LNG deal for Tokyo Gas was signed in February 2019 when it teamed up with UK utility Centrica for a binding joint long-term agreement to receive volumes from the onshore Mozambique LNG export project in southeast Africa being constructed by Anadarko Petroleum of the US and its partners. Tokyo Gas and Centrica have agreed to jointly purchase 2.6 million tonnes per annum of cargoes worth \$25 billion delivered over 20 years from the Mozambique plant. The Japanese and UK utilities said that their “innovative joint procurement approach” takes full advantage of Mozambique’s central location between Europe and Asia, assisting both companies to access diverse markets.

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TOSHIBA CORP. said it was facing regulatory hold-ups in its planned off-loading of its US liquefied natural gas business in Texas to a Chinese company, including a tolling agreement for the Freeport LNG project. The Japanese conglomerate said it was facing complications as the group also attempts to restructure its widespread business operations. Toshiba, attempting to emerge from a crisis caused by an accounting scandal and massive losses in the nuclear business, is currently in a five-year recovery plan and is set to pay China's ENN Group to take over a 20-year tolling agreement at the Freeport plant on Quintana Island. The ENN Group has agreed to accept over \$800 million to assume Toshiba's commitment to the 20-year deal that would amount to 2.2 million tonnes per annum of LNG from the Freeport facility under a liquefaction tolling agreement (LTA) structure. Under the original plan, the Toshiba-ENN transaction was expected to be completed by the end of March 2019. Toshiba now says it is facing a delay in securing approval from the Committee on Foreign Investment in the United States, a federal agency that examines the national security implications of foreign investments.

Toshiba had hoped the losses on its LNG investment would not be carried over from the previous fiscal year to the coming business year. The Japanese group entered the LNG market in 2013 by signing its agreement with Freeport. ENN Group is a natural gas and LNG market participant listed in Hong Kong. In China, ENN supplies gas in cities, operates pipelines and engages in gas trading. It is trying to diversify its supply sources by purchasing the Toshiba operations. Toshiba now say that it hoped to complete the transfer of its interests in the LNG business before the end of April 2019 or shortly thereafter. The Toshiba deal with ENN involves concluding a purchase and sales agreement for the transfer of all outstanding shares of Toshiba America LNG Corp. to ENN. Toshiba is making a provision for a 93 billion yen (\$838M) loss on its Freeport LNG accord and related activities.

TOTAL, the French energy major and the Sultanate of Oman have signed an accord for the development of an onshore natural gas block that will provide feed-gas for liquefied natural gas production reserved for LNG fuel for shipping in the

Arabian Peninsula. The deal was signed between Ministry of Oil and Gas of Oman and Total and is linked to the award of exploration licence for onshore Block 12 where there are "significant prospective" gas resources. Under the terms of a heads of agreements, both parties will finalize in the coming months a definitive deal that will grant to Total 100 percent working interest and operatorship of the exploration Block 12, located in Central Oman. Total said it would use its equity gas entitlement as feedstock to develop in Oman a regional hub for LNG bunkering services to supply LNG as a fuel. Oman is a major anchorage and stop-over point for tankers and other vessels on trade routes between the Middle East, Asia and Europe. Total has previously outlined plans for its LNG hub project involving a small-scale modular liquefaction plant to be built in Oman's Sohar port. The plant would be supplied with Greater Barik feed-gas and would comprise a processing Train with capacity of around 1 million tonnes per annum and would offer the flexibility for expansion as required by the development of the LNG bunkering market.

"The plan includes resources of the Greater Barik area (Blocks 10 and 11), as well as building and operating a liquefaction plant to offer a bunkering service and supply LNG as a fuel to marine vessels," said a statement. The French company is already a 7.5-percent shareholder in the Oman LNG project at Sur in the south of the country. The Omani facilities export to Japan, South Korea and the spot market and comprise the amalgamated three liquefaction Trains of Oman LNG and Qalhat LNG, now producing more than 10 million tonnes per annum. Total Chief Executive Patrick Pouyanne said his company welcomed the opportunity to bring its expertise in the natural gas value chain to Oman. "After the agreement reached on the integrated gas project of the Greater Barik area, the entry into exploration Block 12 represents a new exploration opportunity to unlock additional gas potential and to contribute to income growth and job creation," added the CEO. Spread over 10,000 square kilometres, Block 12 is located onshore in the northern part of Block 6 and to the south of the Greater Barik area. Total said its exploration programme on the block will involve seismic acquisition and drilling commitments, with the drilling of a first well in 2020.

TOTAL, the French energy major, said at the LNG2019 conference in Shanghai that it had signed a series of agreements to strengthen its foothold on the US Gulf Coast with equity stakes and additional volumes. Total said it signed its deals with Tellurian Inc., a company in which it already has shares and the developer of the Driftwood LNG project in Louisiana. The accords signed were a Heads of Agreement committing Total to invest in the development company Driftwood Holdings and another to take its supply from the venture to 2.5 million tonnes per annum of LNG. Total said it would make an additional equity investment in the Driftwood LNG joint venture and purchase more offtake. The final environmental impact statement was issued by the US Federal Energy Regulatory Commission in January 2019 to develop the liquefaction plant to produce around 27.6 million tonnes per annum of LNG. Tellurian and Total said they planned a sales and purchase agreement (SPA) for a further 1.5 MTPA of LNG from Tellurian Marketing's offtake volumes from the Driftwood venture. The sales agreement will be for the purchase of free-on-board (FOB) whereby Total supplies the shipping for a minimum term of 15 years and at a price based on the Platts Japan Korea Marker (JKM). Total's equity agreement gives the French company an additional 20 million shares of Tellurian common stock for an amount of \$200 million, adding its previous investment.

The agreements are subject to the relevant regulatory approvals and to the final investment decision of the Driftwood project. "These agreements increase our commitment to Driftwood LNG, a highly cost-competitive project that benefits from the low gas production costs and prices in the US," said Patrick Pouyanne Chairman and Chief Executive of Total. "In line with our strategy to become a major LNG portfolio player, this transaction will add 2.5 MTPA of competitive US LNG to Total's portfolio and strengthen our positions in the US," added Pouyanne. Total has been a shareholder in Nasdaq-listed Tellurian since 2017, after the Group acquired 46 million shares for an amount of \$207M. Tellurian said it was expecting to have about six partners-customers when it takes its final investment decision for the first phase of the joint venture near Lake Charles that will cost a total of \$30 billion.

The company is expected to take its

final investment decision by mid-2019 and would progress to producing the first LNG in 2023 and complete the project in 2026.

TURKEY has built another LNG-powered ferry that entered service in the Mediterranean for the Italian company Caronte after being constructed at the Sefine shipyard at Yalova. The gas propulsion system was supplied by MAN Cryo for the ferry "Elio", a double-ended RoPax ferry, designed by LMG Marin of Norway for Italian shipowner Caronte. The MAN Cryo propulsion system supplies gas to the ferry's three dual-fuel engines. The vessel will primarily operate in the Strait of Messina between the Italian mainland and the Sicilian city of Messina. MAN Cryo, the Swedish subsidiary of Augsburg, Germany-based MAN Energy Solutions said it supplied a vacuum-insulated type C tank with 150 cubic metres of volume and associated airlock, valves, piping, vaporization equipment and a heat-exchanger unit. "This project is of strategic importance since it is the very first RoPax vessel in the Mediterranean to operate on LNG," said Louise Andersson, the senior executive at MAN Cryo. "It follows MAN's vision to become a leading supplier in the regions where we see a strong growth of demand for LNG solutions," added Andersson.

The 133-metre long and 21.5m wide ferry will have a capacity of up to 290 cars on two vehicle decks. It can carry 1,500 passengers with a service speed of 18.5 knots. Luigi Genghi, General Manager of Caronte, said his company was very pleased with the performance of the LNG system that MAN Energy Solutions had provided. "Since the 'Elio' is operating on a tight schedule on a daily basis, it is important that the gas-supply system works during all circumstances. In this perspective, MAN Energy Solutions is our trustworthy partner," he added. Sefine Shipyard said it was satisfied with the high-quality standard of the equipment, start-up, commissioning and after-sales services of MAN Cryo in the "Elio" project as the first ferry of its type in the Mediterranean to have LNG propulsion.

US domestic natural gas demand is increasing for gas-fired power plants as the number of facilities has now overtaken coal-fired plants as the power industry competes with liquefied natural gas export projects for abundant feed-gas resources. There are six new liquefaction

facilities under construction or completed in the US. They are Cove Point in Maryland, Corpus Christi in Texas, Cameron LNG in Louisiana, Elba Island in Georgia, Sabine Pass in Louisiana and Freeport in Texas. All six will be competing with the gas-fired power industry before the end of 2019. The expansion of the Panama Canal in 2016 has been key to connecting US LNG to consumer markets in Asia and the domestic natural gas demand by power plants means the growing shale-gas production will find ready takers. According to the US Energy Information Administration, the amount of generating capacity from natural gas-fired combined-cycle (NGCC) plants has grown steadily over time and in 2018 surpassed coal-fired plants as the technology with the most electricity generating capacity. US generating capacity at NGCC power plants totaled 264 gigawatts (GW) in January 2019 compared with 243 GW at coal-fired power plants. The NGCC power plants accounted for about half of all US natural gas-fired generating capacity, but they provided almost 90 percent of total natural gas-fired generation.

Capacity factors for NGCC plants, which reflect their actual output as a percentage of their capacity, are nearly equivalent to those of coal plants and are typically in the 50 percent to 60 percent range, while natural gas combustion and steam turbines are much lower at about 10 percent,” said the EIA. Since the beginning of 2015, about 40 GW of coal-fired capacity have retired, and no new coal capacity has come online in the US. “During that same time period, NGCC net capacity has grown by about 30 GW. The electricity generation from these NGCC capacity additions, as well as output from new wind and solar generators, has largely offset the lost generation from coal retirements,” said the EIA. “In terms of electricity generation, NGCC plants have recently begun providing more electricity than coal plants,” explained the EIA. “Electricity generation from NGCC power plants first surpassed coal-fired generation on a monthly basis in December 2015 and again in the first half of 2016, during times of relatively low natural gas prices,” it added. “Higher natural gas prices reversed the crossover until February 2018, when NGCC generation again surpassed coal generation,” said the report. “As more NGCC plants continue to come online and coal plants continue to retire, NGCC-

powered electricity generation should consistently rank as the most prevalent source of electricity generation in the US for the foreseeable future,” stated the agency.

US regulators have issued a draft environmental impact statement for the Jordan Cove LNG export project in the northwest state of Oregon. The Canadian-led venture has received its notice from the Federal Energy Regulatory Commission. Pembina Pipeline Corp. is

the Canadian owner of the Jordan Cove export project proposed for Coos Bay in Oregon. The plant would comprise five small-scale liquefaction Trains each with 1.5 million tonnes per annum of output for a total of 7.8 MTPA. It will also include two full-containment LNG storage tanks with total capacity of 320,000 cubic metres, gas treating facilities, an export jetty and access to more than 25 billion cubic feet per day of gas supply from Western Canada and the US Rockies. “We conclude that constructing and operating

the Project would result in temporary, long-term, and permanent impacts on the environment,” said the FERC in its draft report. “Many of these impacts would not be significant or would be reduced to less than significant levels with the implementation of proposed and/or recommended impact avoidance, minimization, and mitigation measures,” it added. “However, some of these impacts would be adverse and significant. Specifically, we conclude that constructing the project would

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temporarily but significantly impact housing in Coos Bay and that constructing and operating the project would permanently and significantly impact the visual character of Coos Bay,” the regulator stated.

“Furthermore, constructing and operating the project is likely to adversely affect 13 federally-listed threatened and endangered species,” said the FERC. However, the FERC did note in its comments that the applicants said they would implement their “Erosion Control and Revegetation Plan”, “Wetland and Waterbody Construction and Mitigation Procedures” and “Upland Erosion Control, Revegetation, and Maintenance Plans” as well as other impact avoidance, minimization and mitigation measures. As proposed, the LNG plant would be visited by about 120 LNG carriers per year and Pembina has confirmed that it had signed preliminary accords with Jera Co Inc. and Itochu Corp. of Japan for the supply of LNG. The US Coast Guard has already issued a Letter of Recommendation indicating that the Coos Bay Federal Navigation Channel would be considered suitable for the LNG marine traffic associated with the project. The FERC added that the pipeline would originate at interconnections with existing pipeline systems in Klamath County in Oregon and would span parts of Klamath, Jackson, Douglas, and Coos counties before connecting with the LNG plant. “The approximately 229-mile-long, 36-inch-diameter pipeline would be capable of transporting up to 1.2 billion cubic feet of natural gas per day,” said the FERC. The regulator said that the draft EIS comment period closes on July 5, 2019.

WOODSIDE Petroleum is developing more liquefied natural gas use in Western Australia for trucking, shipping and for fuel in mining operations. Woodside has opened a truck-loading facility at its Pluto LNG export plant. The state Premier of Western Australia, Mark McGowan, officially opened the facility at a ceremony at the coastal town of Karratha, near the Dampier LNG export terminal. The medium-term aim for the shipping sector is to supply LNG fuel to heavy iron ore carriers sailing from Western Australia to Asia. However, Woodside’s initial focus is on supplying trucked LNG to mining operations and communities in the Pilbara, Kimberley and other regions of the state for power generation and as reliable, flexible and cost-competitive fuel.

The trucked LNG will also be used to supply coastal shipping with gas-fuel capability, including the LNG-powered offshore support vessel “Siem Thiima” which joined Woodside’s fleet in 2017. Woodside said that after full commissioning the facility would initially be able to deliver seven LNG truck loadings per day, each one transporting the equivalent of more than 80,000 litres of diesel. “At this initial capacity, replacing that diesel with LNG could reduce life-cycle greenhouse gas emissions by more than 120,000 tonnes per year,” said Woodside. The truck-loading bay’s capacity can be doubled by moving to 24-hour operations and can be further expanded if needed to meet future market demand. “In the longer term, the availability of LNG from the truck-loading facility could support the transition towards cleaner fuel for trucks and trains in the region’s heavy transport sector,” explained the company.

“Woodside is also planning to develop infrastructure for supplying LNG to the international shipping industry, particularly iron-ore carriers on the busy trade route from the Pilbara to Asia,” said Woodside Chief Operations Officer Meg O’Neill. She added that the Pilbara region was an ideal hub for an LNG fuels market, with established LNG processing facilities located close to large-scale mining operations and port infrastructure. “The Pluto LNG Truck Loading Facility is a further demonstration of our commitment to supplying domestic gas, and highlights Woodside’s drive to find new markets for our cleaner LNG,” said O’Neill. “Around three billion litres of diesel are imported into the Pilbara every year, mainly for the mining industry. In addition, the ships exporting iron ore to international markets from the Pilbara consume approximately five billion litres of heavy fuel oil annually,” she explained. “Woodside believes that LNG produced here in Western Australia can replace those higher-emissions fuels, delivering environmental benefits while supporting the growth of local industries and creating new markets for locally produced LNG,” stated the Woodside executive. At the Karratha ceremony, Woodside also thanked its joint venture partners at Pluto LNG, the Japanese utilities Kansai Electric and Tokyo Gas and the downstream joint venture partner EDL Energy, as well as trucking partner Linfox and foundation customer Sheffield Resources.

WOODSIDE, the operator of two LNG export plants in Western Australia and with expansion plans, has signed a preliminary accord with the privately-run Chinese ENN Group to provide supplies over a 10-year period. Woodside said its Heads of Agreement with ENN was for the sale of 1.0 million tonnes of LNG per annum from 2025. As operator of the North West Shelf plant and the Pluto LNG facility, Woodside has growing production volumes and it is also a shareholder in the Chevron-operated Wheatstone plant. The Australian company’s Chief Executive Peter Coleman said the accord with ENN builds on an October 2018 cooperation agreement under which the two companies committed to work together to explore a broad range of potential opportunities. “This HOA demonstrates market support for Woodside’s proposals to expand the Pluto LNG facility and develop the Scarborough offshore gas resource as part of our vision for the Burrup Hub in Western Australia,” explained Coleman. Woodside and ENN are both pursuing growth phases. ENN is aiming to increase its market share in China’s gas distribution sector as well as its participation in overseas projects. ENN is one of the few non-state run energy companies in China able to import LNG and it owns the Zhoushan regasification terminal in eastern Zhejiang province, which received its first cargo in August 2018.

ENN already has supply agreements in place with other LNG market players, including Chevron, Australia’s Origin Energy and French major Total. Woodside said its accord with ENN remained conditional on the execution of a fully termed sales agreement and obtaining all necessary approvals for its expansions. After a year that marked the delivery of the 5,000th LNG cargo from the North West Shelf plant, in service since 1989, Woodside has said that 2020 would see it embark on two new liquefaction, export and domestic gas ventures. Woodside’s Browse Basin development plans would provide additional feed-gas for the North West Shelf facility at a cost of around \$US20.5Bln and the Scarborough gas field project, including the expansion of Pluto LNG, would cost about \$US11Bln. The Australian company will retain 30.6 percent of Browse and the 50 percent of the Scarborough venture so that its investments would amount to about \$US12Bln. The Scarborough and Browse

projects together would produce about 16 MTPA LNG, starting in 2024 and 2026 respectively.

WOODSIDE Chief Executive Peter Coleman told the LNG2019 conference in Shanghai that international energy majors needed to do more to demonstrate as China has already done that a lower-carbon world needs LNG. “This is not just about ensuring we secure markets. It’s about ensuring we are seen as being a significant contributor to reducing greenhouse-gas emissions,” Coleman told the three-yearly industry gathering backed by the International Gas Union. Woodside operates two LNG plants in Western Australia, the Northwest Shelf facility and Pluto LNG, and is expanding its gas hub for the provision of more export volumes and for fuel needs in the maritime and trucking sectors. “We have to work hard to make sure people fully understand the contribution our product makes to reducing the global greenhouse-gas footprint and improving air quality,” stated Coleman. “And nowhere is this more evident than in China, where the commitment to switch to cleaner energy has created opportunities for gas and renewables,” explained the CEO. “This includes displacing coal but also new uses for our product in the transport sector, where LNG can displace heavy fuel oil in ships, and oil or diesel in trucks and trains,” added Coleman.

The Woodside CEO said companies should also advocate global action to promote LNG and cleaner energy and to underpin national commitments. “I know I’m not alone in thinking carbon pricing implemented internationally would be the most effective mechanism for achieving the emissions reductions that are needed,” said Coleman. “This includes through coal-to-gas switching, which has the potential to be even more significant as new LNG markets open up in Asia,” he added. Coleman said that these issues were “front-of-mind” for Woodside as it pursues growth plans in northwest Australia that would significantly increase its LNG production and shore up its position as “a major global supplier for decades” to come. “We have done the math. And I am not just referring to the global LNG supply gap we see emerging from the early 2020s,” said Coleman. “I am also referring to the prospects for our product in an increasingly carbon-constrained world. LNG is part of that world,” declared Coleman. ■



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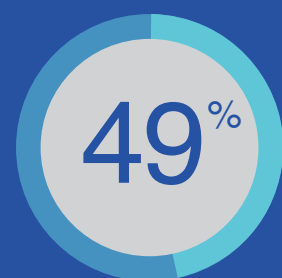
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Countries
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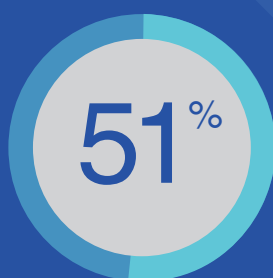
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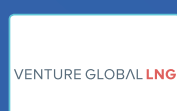
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US government gives view on IMO sulfur cap changes and effects on fuel supply and demand

Report from Washington examines expected impacts on fuel prices and bunkering

Operators of marine vessels have several options for complying with International Maritime Organization 2020 sulfur limits.

They can switch their ships to a lower-sulfur fuel that complies with the new IMO rules, which would likely increase demand for distillate and low-sulfur residual oils.

Exhaust cleaners

Another option is to use exhaust cleaners, known as scrubbers, to remove pollutants from ships' exhaust, allowing ships to continue to use higher-sulfur fuels.

Vessel operators can also switch their ships to nonpetroleum-based fuels, such as liquefied natural gas.

In the Annual Energy Outlook (AEO2019) Reference case projections, the fuel mix of ocean-going marine vessel bunkering in the United States changes significantly because of the new global sulfur fuel limits.

The US government has issued a report entitled "The Effects of Changes to Marine Fuel Sulfur Limits in 2020 on Energy Markets", covering fuel and bunkering expectations.

The US projections only consider sales of bunker fuel from ports inside the United States.

Because the US is a member of the IMO and US port and maritime authorities currently enforce all IMO regulations, the implied rate of compliance to the IMO sulfur limits for the US is 100 percent.

Compliance

Although the level of compliance with the new IMO sulfur limits may vary globally, the AEO2019 (and the Short-Term Energy Outlook) do not make explicit assumptions about compliance levels beyond the US.

Outside of residual fuel oils and distillate, the short-term energy outlook forecasts that the use of LNG in marine bunkering will be limited through 2020.

Similarly, the reference case projects limited use of LNG in the next five years, reflecting the high initial infrastructure development cost and the limited current infrastructure to accommodate LNG bunkering at US ports.

"In the medium and long term, this

infrastructure barrier decreases, and LNG's share of US bunkering grows to 7 percent in 2030 and to 10 percent by 2050.

The Energy Information Administration projects that the share of high-sulfur residual fuel oil consumed by US ocean-going bunker fuel markets drops from 58 percent in 2019 to 3 percent in 2020, and then rebounds to 24 percent in 2022.

"Despite a recent increase in scrubber installation and orders, the number of vessels installed with scrubbers required to continue using high-sulfur residual fuel oil remains limited," said the report.

As a result, the US Outlook projects a large but brief increase in the share of distillate fuel oil and low-sulfur residual fuel oil in 2019 and shortly after 2020.

"A recovery in high-sulfur residual fuel oil consumption driven by scrubber installations does not occur until 2022 but at levels far lower than before the 2020 IMO rule implementation," it added.

After 2023, high-sulfur residual fuel oil consumption declines throughout the AEO2019 Reference case projection, down to a 22 percent share of US ocean-going marine vessel bunker fuel by 2025.

Demand

The EIA projects that the share of low-sulfur residual fuel oil consumed in US ocean-going marine vessel bunkering will increase from 38 percent in 2020 to 43 percent in 2025.

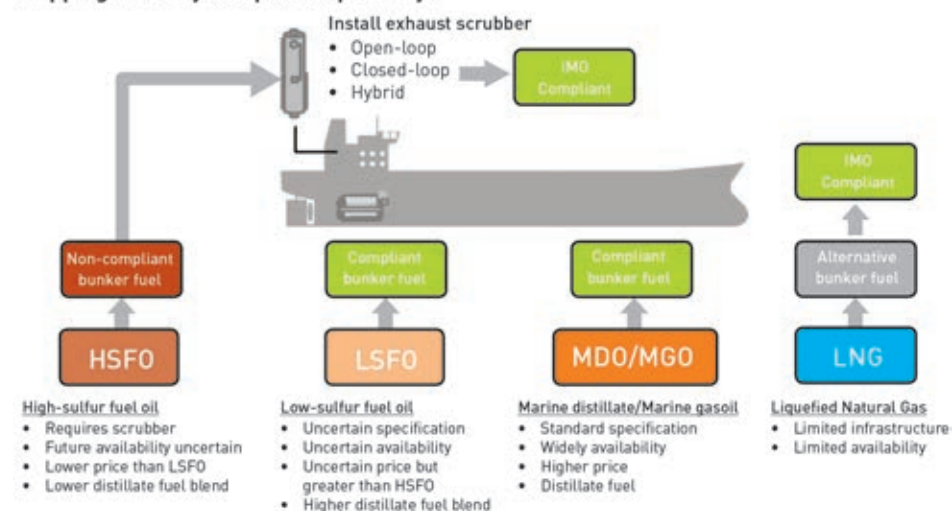
Similarly, it forecasts that the need to use distillate in lower-sulfur bunker fuels will increase distillate's share of US bunker demand from 36 percent in 2019 to 57 percent in 2020, although this share declines to 29 percent by 2025.

Despite bunker fuel's relatively small share of both the global and US liquid fuels markets, the EIA expects a shift in demand in the global bunker fuel market from high-sulfur fuel oil to low-sulfur distillate fuel and low-sulfur fuel oil.

"This shift will result in a change in the relative prices of those fuels. EIA expects the demand shift to increase global prices for light- and low-sulfur refined petroleum products such as diesel fuel, gasoline, jet fuel, and low-sulfur fuel oil," it forecast.

"This shift, in turn, will lead to a

Shipping industry compliance pathways



How vessels can use LNG and other methods of fuel compliance for 2020 sulfur cap such as emission-cleaners and low-sulfur fuel brands

decrease in the prices of high-sulfur refined petroleum products, such as high-sulfur fuel oil," said the report.

Uncertainty

"This price premium for lower-sulfur refined products will be most evident at the wholesale (refinery and bulk terminal) level in the form of higher refining margins for low-sulfur products such as diesel," it added.

"The effects of implementing the IMO 2020 regulations are highly uncertain," according to the report.

"Many policy and technical complications, as well as potential market participant responses, create numerous interrelated factors that will have a significant influence on the eventual outcome," stated the EIA.

"Further, these factors are highly interdependent on one another, making cause and effect difficult to disentangle," it stated.

"The IMO designed the 2020 sulfur regulation as an open policy without designating one compliance method but instead letting market participants decide for themselves how best to comply," explained the report.

Slow

"However, this openness, the complexities of implementation, and the number of participants limited the first-mover advantage toward compliance," it added.

In the years leading up to 2020, with little to no first-mover advantage, it has been noted that stakeholders have been

slow to provide clear intentions of their compliance methods.

EIA's forecasts and projections related to IMO 2020 are a result of detailed insights, modeling, and data on the US refining and shipping sectors and from more general assumptions about how these sectors would react globally.

Because the shipping industry and the fuels used in that industry are globally integrated markets, a globally integrated supply and demand model would be required to comprehensively model the effects of the IMO 2020 rule.

Although EIA does not currently have such a model, it does employ an integrated supply and demand model for the US petroleum market, which was used to produce many of the results outlined in the first section of this report.

The global response of these industries is equally as important as the response in the United States.

Lack of data

However, without the same level of modeling globally, the degree of uncertainty in EIA's assessment increases significantly.

In addition, the current lack of production, consumption, efficiency and logistical data for non-US marine fuels and the shipping industry makes this effort more difficult.

"The EIA will continue to readjust its forecast and projections related to IMO 2020 as more information on these uncertainties become clear, as more data become available and as newer models

are developed,” stated the report. No doubt there are periods of uncertainty ahead for both refiners and shippers.

New fuel specifications: The IMO set the sulfur limit for marine fuels at 0.5 percent or lower after January 2020, but the many other specifications needed to establish a uniform fuel specification were left to the International Standards Organization and other industry participants.

As of March 2019, a final specification for the new, compliant low-sulfur marine (bunker) fuel is not complete. However ISO has issued a statement that the existing 2017 standard may be used with the lower sulfur requirement

Scrubber uptake: A small number of existing marine vessels have already installed scrubbers, and the EIA does not expect that number to increase significantly before 2020 because of time constraints and limited installation capacity. Even if scrubbers become widely adopted, which would allow operators to continue to use fuels with higher sulfur content, the price and availability of

higher-sulfur fuels after 2020 remains uncertain.

In addition, some maritime and port authorities have regulations in place or may implement regulations that would limit the operation of scrubbers in their waters, depending on the configuration.

Open-loop

Open-loop scrubber systems use seawater to remove sulfur from exhaust gas, but they discharge the resulting wash water back into the ocean. A closed-loop scrubber system retains the wash water onboard for later processing and disposal.

A hybrid-loop scrubber system allows wash water to be discharged when in the open seas, but the system retains it onboard when in controlled waters. In terms of cost, open-loop scrubber systems are the least expensive, followed by hybrid, and then closed-loop scrubber systems.

Several major ports, including Singapore and large commercial ports in China, have banned open-loop scrubber systems.

This ban forces ships equipped with

the less expensive open-loop systems to switch to a lower-sulfur marine fuel when operating in certain waters, adding to scrubber uptake uncertainty.

Compliance and enforcement: The sulfur content of transportation fuels has been declining for many years because of increasingly stringent regulations implemented by individual countries or groups of countries.

However, the upcoming IMO 2020 rules apply across multiple countries’ jurisdictions to fuels used in the open ocean, and they leave the enforcement up to flag states - or the nation in which a vessel is registered.

Willingness

The capacity and willingness to enforce the IMO 2020 ruling among flag states are uncertain.

However, many large commercial port and maritime authorities have stated they intend to enforce IMO compliance on vessels entering their waters, in a similar way that they enforce local and national regulations on fuel quality, but the penalties

or costs of non-compliance vary widely.

“If the costs of complying exceed the penalty for non-compliance or if the risks of enforcement are low, then use of high-sulfur marine fuels may continue in larger quantities than expected past 2020,” said the report.

“Conversely, if the penalties for non-compliance and the risk of enforcement are high, then the continued use of high-sulfur marine fuels may be much lower than expected past 2020,” it added.

“For these reasons, changes in the rate of compliance and enforcement have significant influence on market outcomes because of the IMO 2020 rules,” it stated.

To increase compliance certainty, the IMO passed a ban on carrying non-compliant high-sulfur bunker fuel on any ship that did not have a scrubber system installed unless the non-compliant fuel was that ship’s cargo.

“This ban is set to go into effect in March 2020. This carriage ban gives port and maritime authorities another method of enforcing compliance with the new sulfur regulations,” said the report. ■

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American Bureau of Shipping supports growth in LNG infrastructure before IMO deadline

Aditya Aggarwal, ABS Director, Global Gas Development

LNG as marine fuel has moved from being a promising option to a serious alternative for the shipping industry ahead of the International Maritime Organization's 0.5 percent global sulfur cap coming into effect in 2020.

Until recently, shipping has been faced with the absence of an adequate bunkering supply chain in place meaning that fewer owners would commit to LNG and this in turn slowed development of infrastructure.

Orders

The impasse has now been broken with the ordering of more LNG-powered shipping capacity and parallel commitments to provide the required bunkering tonnage.

With five vessels already in service, 10 on order and many others in the pipeline globally, the LNG bunkering market is developing with new momentum with market players around the world joining the movement.

In some of the key projects around the world, owners, operators and bunker suppliers are turning to ABS to support the development of the LNG infrastructure required to provide the missing link in LNG bunkering.

ABS is the class society of choice for North America's first LNG bunker barge to feature membrane containment, ordered in 2015 and stationed in



'Clean Jacksonville' barge, owned by TOTE Maritime and managed by Clean Marine Energy, is based in Florida

The "Clean Jacksonville" vessel, owned by TOTE Maritime and managed by Clean Marine Energy, is being used to bunker TOTE's two 3,100-TEU Marlin-class containerships that are currently in operation between the US and Puerto Rico.

The barge includes a 2,200 cubic metres GTT Mark III Flex cargo containment system and started operations in the first quarter of 2019.

Charter

Shell Trading (US) Co. at the end of 2017 said it had reached a long-term charter agreement with Q-LNG Transport for a 4,000 cubic metres capacity LNG bunker barge.

This marked another step in the development of the LNG

value chain supporting cleaner shipping in the US, where owners of domestic tonnage have moved to adopt LNG as a means of compliance with the existing Emissions Control Area.

Delivery range

Shell's announcement brings the US-based Jones Act LNG bunker barge fleet to two, both of which are classed by ABS.

This newest LNG Articulated Tug Barge (ATB), will be owned and constructed by Q-LNG while operations will be handled by New Orleans-based Harvey Gulf International Marine.

The barge will be chartered by Shell and will supply LNG fuel to vessels across the Southeast of the US, including Carnival Cruise Line vessels in Florida that are its anchor customers.

The barge features a Type-C cargo containment system and will be designed for efficient LNG bunker delivery to a range of receiving vessels.

VT Halter Marine in Pascagoula, Mississippi, began construction of the barge in 2018 with delivery expected by January 2020.

ABS and Harvey Gulf worked together on the successful delivery of five US-

based LNG-powered Offshore Support Vessels (OSVs), with a sixth on order.

This ground-breaking newbuilding program demonstrated early US leadership in the development of LNG as marine fuel, with Harvey Energy, the first vessel in North America to be powered by LNG delivered in February 2015.

The adoption in the U.S. has been comparatively slower than was anticipated a few years ago. This cannot be attributed to the availability of natural gas in the US since there is abundance of the hydrocarbon as a result of the U.S. shale gas revolution.

The key challenge in the development of marine LNG bunkering in the U.S. is a limited demand to justify new small-scale bunkering projects.

Novel concept

To address this, novel concepts are being introduced to efficiently meet the circumscribed demand and ABS has been at the forefront of supporting the industry by vetting these concepts via the ABS Approval-in-Principle process.

The trend towards LNG as fuel is also growing strongly in Asia and in particular Singapore which is constructing a

The key challenge in the development of marine LNG bunkering in the U.S. is a limited demand to justify new small-scale bunkering projects.

Jacksonville, Florida.

dedicated onshore LNG bunkering terminal.

To support the development of the LNG supply chain, FueLNG Pte will build Singapore's first LNG bunker barge to be classed by ABS. The vessel being built at China's Keppel Nantong Shipyard.

Given requirements for lower emissions from shipping, this project is an important milestone for the region and is a key component of Singapore's strategy to be a global LNG fuel hub.

The bunker barge, with 7,500 cubic meters of LNG capacity, will be owned and operated by FueLNG Pte, a joint venture between Shell and Keppel O&M.

The vessel will be based in the Port of Singapore and will supply LNG to large ocean-going vessels throughout the region.

Funding

To support the project, Singapore's Maritime and Port Authority granted \$3M to FueLNG Pte to part-fund the construction of the vessel.

That LNG as fuel has become a global phenomenon can be seen from the 2018 announcement by Athens-based Probunkers, which plans to design, build, own and operate a fleet of LNG bunkering vessels in seven ports initially: Houston; Rotterdam (or Antwerp); Gibraltar; Singapore; Hong Kong; Busan and Fujairah.

ABS has signed a pioneering Joint Development Program (JDP) with Probunkers to provide technical support to the project as it embarks on designing a fleet of specialist LNG bunker vessels for key ports around the world.

ABS will draw on its wealth of expertise to help Probunkers meet the technical and operational challenges that a project of this scale and ambition will need to overcome.

Investment in newer markets such as LNG as fuel is always a potential risk for shipowners and ABS is proud to be the trusted advisor supporting the industry in this transition.

Changes

Recognizing the changing landscape and increased industry focus on gas transport and as fuel, ABS launched its Global Gas Solutions team in 2013 to support industry in developing gas-related projects.

The ABS Global Gas Solutions team provides industry leadership, offering guidance in LNG floating structures and

systems, gas fuel systems and equipment, gas carriers, and regulatory and statutory requirements.

ABS has extensive experience with the full scope of gas-related assets and has been the classification society of choice for some of the most advanced gas carriers in service.

To support the increased global demand for LNG bunkering vessels and provide the industry with reliable guidance that enables innovative technologies to support the sector, ABS

published the Guide for LNG Bunkering in 2017.

This Guide has been developed to outline the requirements for the design, construction, and survey of liquefied gas carriers and barges fitted with dedicated LNG transfer arrangements and intended to operate in regular LNG bunkering service.

The objective of the Guide is to provide criteria to minimize risks to the vessel, crew and the environment during ship-to-ship LNG transfers. The Guide also addresses

bunkering station safety, lifting and hose handling equipment, control, monitoring and emergency shutdown safety systems and emergency release systems.

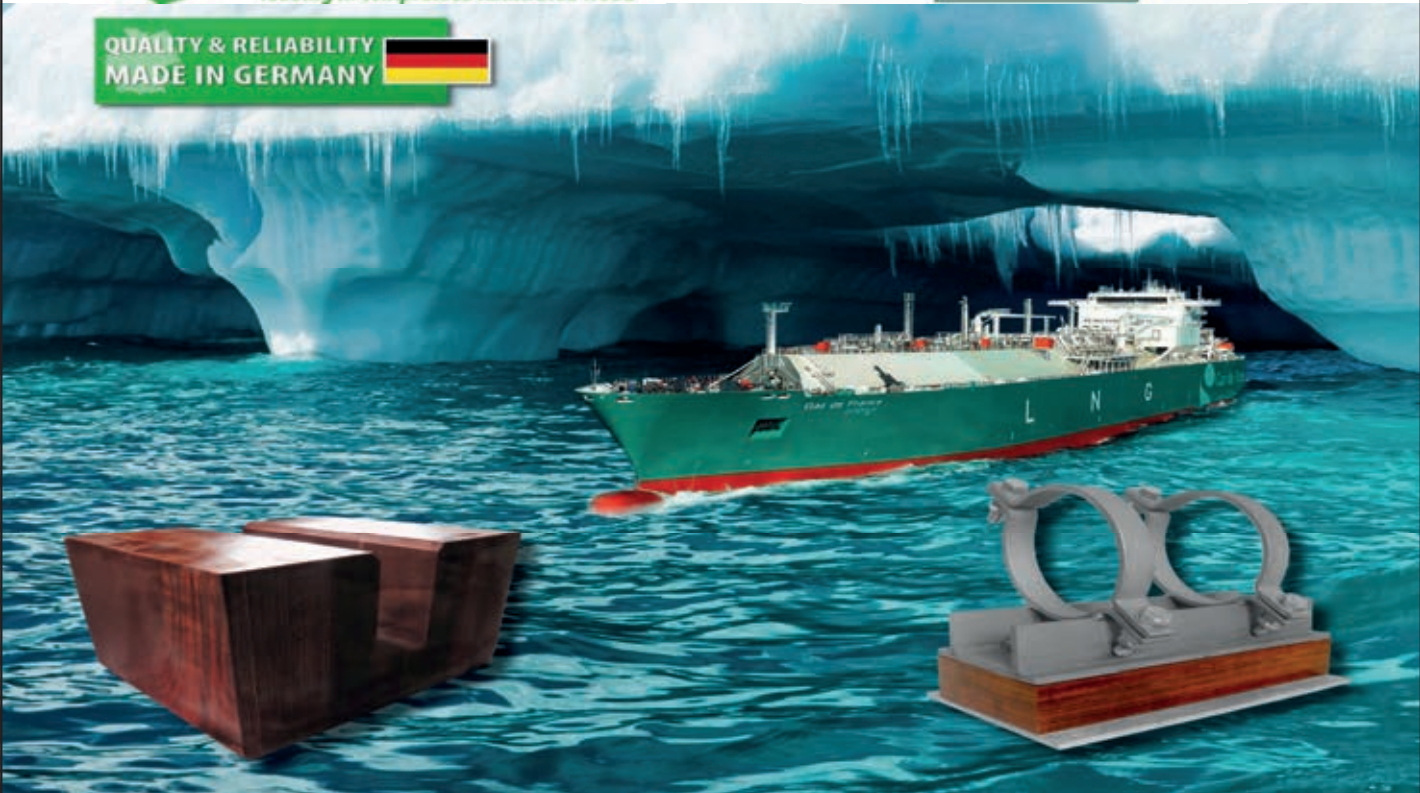
ABS has also developed guidance for the design and construction of liquefied gas tank barges with remote control and monitoring of essential systems.

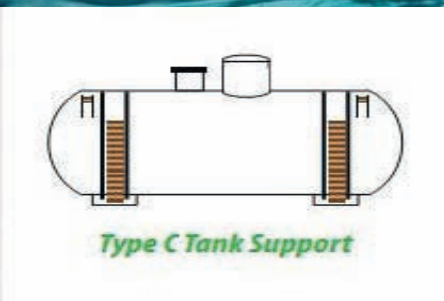
The Guide applies to Control, Alarm, and Monitoring Systems of periodically unattended barges from an attended Remote Control and Monitoring Station on their associated towing vessels. ■



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French major Total overhauls divisions to align with focus on more LNG stakes and trading

Profitable growth of integrated gas value chain is one of key axes of Total's strategy

French major Total has said that its overall liquefied natural gas volumes are on the rise and are set to jump substantially for a third consecutive year and in the future when the focus is on securing more long-term Russian and US offtake.

Total's LNG sales amounted to 15.6 million tonnes in 2017 before rising to 21.8MT in 2018, while they are set to increase again in 2019.

This is on account of extra volumes from Yamal LNG in Russia, Ichthys LNG in Australia and US shipments.

Growth

The company has also undergone an overhaul of its various divisions. LNG is now part of the Integrated Gas, Renewables & Power business.

“The profitable growth in the gas and low carbon electricity integrated value chains is one of the key axes of Total's strategy,” said the company.

“In order to give more visibility to these businesses, a new reporting structure for the business segments’ financial information has been put in place and is

The IGRP segment spearheads Total's ambitions in integrated gas and consists of integrated gas and the upstream and midstream LNG activity that was previously reported in the E&P segment.

Sales boost

In its first-quarter earnings, Total's LNG sales in the quarter were 7.7MT compared with 3.8MT in the same three months of 2018.

The company said adjusted net operating income in the IGRP division was \$592M in the quarter, up 23 percent year-on-year because of the strong increase in LNG sales offset by lower natural gas prices.

“The division's operating cash flow before working capital changes increased by 55 percent year-on-year, thanks to growing LNG production of more than 50 percent and a doubling of LNG sales activity,” said Total.

Total said that the overall markets remained volatile as it posted adjusted net income of \$2.8 billion this quarter, down 4 percent from the same period of 2018 when it was \$2.9Bln.

Total also logged its LNG asset sales and acquisitions during the quarter.

India

Asset sales completed in the first quarter brought in \$363M, comprising mainly of the sale of the group's interest in the Hazira LNG import terminal in India and a small business in China.

“Acquisitions completed in the first quarter cost \$669M and related mainly to the signature of the acquisition of a 10 percent stake in the Arctic LNG 2 project in Russia,” said Total.

The deal with Russian natural gas

Country	Asset	% equity
Angola	Angola LNG	13.60%
Australia	Gladstone LNG	27.50%
Australia	Ichthys	26.00%
Nigeria	Nigeria LNG	15.00%
Nigeria	OML 58	40.00%
Norway	Snohvit	18.40%
Oman	Oman LNG	5.54%
Oman	Qalhat LNG	2.04%, indirect participation through Oman LNG
Papua New Guinea	Papua LNG	40.10%
Qatar	Qatargas 1 Upstream	20.00%
Qatar	Qatargas 1 Downstream	10.00%
Qatar	Qatargas 2 Train 5	16.70%
Russia	Arctic LNG 2*	10.00% direct working interest
Russia	Yamal LNG	20.02% direct working interest (29.72% including indirect interest**)
United Arab Emirates	ADNOC LNG	5.00%
USA	Barnett Shale ***	90.92% in average
Yemen	Yemen LNG	39.62%

Countries where Total has LNG-focused present and future output volumes

company Novatek, operator of the Yamal export plant, for the acquisition of a direct 10 percent stake in the Arctic II joint venture is seen as advantageous

Total already owns a 19.4 percent stake in the Novatek company so its 10 percent direct stake gives it 21.6 percent of the Arctic LNG II project, while Novatek intends to retain 60 percent of the venture.

“Should Novatek decide to reduce its participation below 60 percent, Total will have the possibility to increase its direct share up to 15 percent,” said the French company.

The Arctic II project's final investment decision is expected to be taken in the second half of 2019, with plans to start up the first liquefaction Train in 2023.

The Russian venture will have three Trains, each with a capacity to produce around 6.6 MTPA.

Nearshore

The Trains will be installed on Gravity Based Structures made of concrete and including LNG storage facilities totalling 687,000 cubic metres capacity.

“We are delighted to have concluded the definitive agreements for our entry into this new world-class LNG project based on the vast Russian gas resources alongside our partner Novatek,” said Patrick Pouyanne, Chairman and Chief Executive of Total.

“Arctic II builds on the success of Yamal LNG and will introduce several innovative solutions to further increase competitiveness,” added the Total CEO.

“It fits into our strategy of growing our LNG portfolio through competitive developments based on giant low-cost resources primarily destined for the fast growing Asian markets,” stated Pouyanne.

Feed-gas

With production capacity of 19.8 MTPA, or 535,000 barrels of oil equivalent per day, Arctic II will develop huge resources in the Utrenneye onshore gas and condensate field.

The developers have said that production would be delivered to international markets by a fleet of ice-class LNG carriers using the Northern Sea Route and a trans-shipment terminal in Kamchatka for cargoes destined for Asia.

There will be a second trans-shipment terminal close to Murmansk for those cargoes destined for Europe.

Novatek started operations at the Yamal plant in December 2017 and already has all three Trains in operation to produce its nameplate capacity of 16.5 MTPA.

It has also made progress on its second venture with the awarding of equipment contracts for Arctic II.

“Arctic II builds on the success of Yamal LNG and will introduce several innovative solutions to further increase competitiveness”

organized around four divisions.

These are Exploration & Production, Integrated Gas, Renewables & Power, Refining & Chemicals and Marketing & Services.

German power equipment-maker Siemens signed a contract on providing compressors for three liquefaction Trains planned for the new plant.

Scope

The scope of supply under the contract includes three feed-gas compressors and six boil-off gas compressors.

Saipem, the Italian energy and LNG engineering company, was awarded one of the first main construction contracts in December 2018 with Renaissance, a Turkish oil and gas services company.

That contract is worth around \$2.5 billion and involves the design and construction of the platform-based venture.

The Trains and storage will be on three 30-metre high concrete GBSs on a surface area of 330 metres by 52 metres.

These concrete GBSs will be fabricated in two dry docks in a Novatek-provided facility in the Russian port of Murmansk. Subsequently, they will be towed and installed in Gydan.

At the same time, Total has

strengthening its foothold on the US Gulf Coast with equity stakes and additional volumes.

It is already has a stake in the Cameron plant in Hackberry, Louisiana, that is being developed by Semptra Energy and now heading for commercial operations.

Total has a broader agreement with Semptra in relation to its other production ambitions for 45 MTPA of output in the US and Mexico.

The French company signed other agreements in April 2019 with Tellurian Inc., a firm in which it already has shares and the developer of the Driftwood LNG project in Louisiana.

Two deals

The accords signed were a Heads of Agreement committing Total to invest in the development company Driftwood Holdings and another to take its supply from the venture to 2.5 MTPA of LNG.

Total said it would make an additional equity investment in the Driftwood LNG joint venture and purchase more offtake.

The final environmental impact statement was issued by the US Federal Energy Regulatory Commission in January 2019 to develop the liquefaction plant to produce around 27.6 MTPA of LNG.

FOB cargoes

Tellurian and Total said they planned a sales and purchase agreement for a further 1.5 MTPA of LNG from Tellurian Marketing's offtake volumes from the Driftwood venture.

The sales agreement will be for the purchase of free-on-board volumes whereby Total supplies the shipping for a minimum term of 15 years and at a price based on the Platts Japan Korea Marker.

Total's equity agreement gives the French company an additional 20 million shares of Tellurian common stock for an amount of \$200M, adding its previous investment.

The agreements are subject to the relevant regulatory approvals and to the final investment decision of the Driftwood project.

"These agreements increase our commitment to Driftwood LNG, a highly cost-competitive project that benefits from the low gas production costs and prices in the US," said CEO Pouyanne.

"In line with our strategy to become a major LNG portfolio player, this transaction will add 2.5 MTPA of competitive US LNG to Total's portfolio and strengthen our positions in the US," he added.

Total has been a shareholder in Nasdaq-listed Tellurian since 2017, after the Group acquired 46 million shares for an amount of \$207M.

Tellurian said it was expecting to have about six partners-customers when it takes its final investment decision for the first phase of the joint venture near Lake Charles that will cost a total of \$30 billion.

The US company is expected to take its final investment decision by mid-2019 and would progress to producing the first LNG in 2023 and complete the project in 2026.

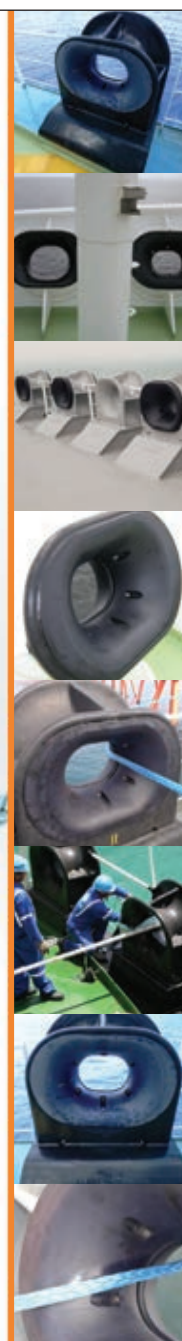
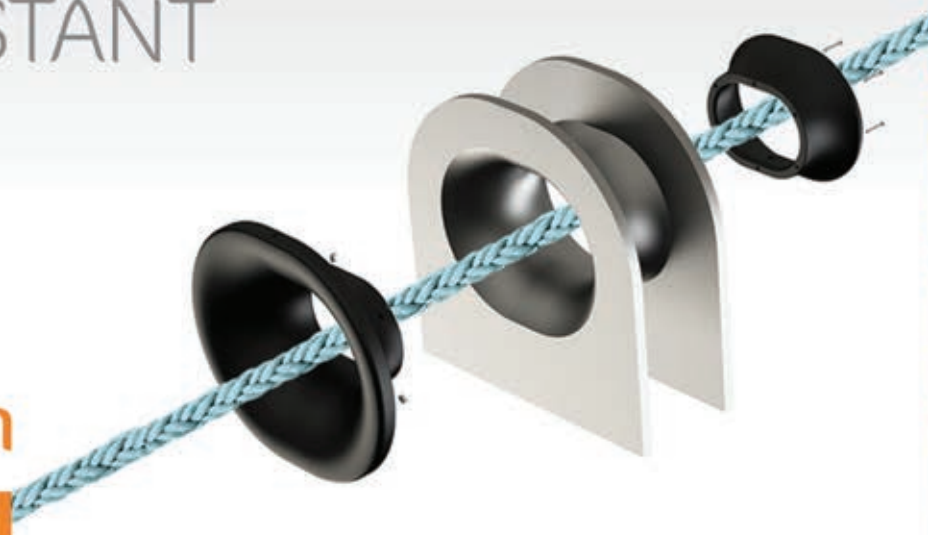


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World LNG Carrier Fleet

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	210,185	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

CARRIER FLEET



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
Bahrain Spirit	173,000	Teekay	Daewoo	Sept-18	Bahamas	DFDE	No 96 GW	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
Billis	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
Boris Davydov	172,600	Dynagas	Daewoo	Sept-18	Cyprus	DFDE	GT No. 96	4	Yamal LNG
British Achiever	173,644	BP Shipping	Daewoo	June-18	IOM	MEGI-DF	GT No. 96	4	Various
British Contributor	173,644	BP Shipping	Daewoo	Oct-18	IOM	MEGI-DF	GT No. 96	4	Various
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 Partner	173,644	BP Shipping	Daewoo	Mar-18	IOM	MEGI-DF	GT No. 96	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
Cape Ann	145,000	Hoegh LNG/MOL	Samsung	May-10	Liberia	DFDE	TZ Mk. III	4	Various
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 Lianyungang	174,100	MOL-China LNG	Hudong	June-18	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
Diamond Gas Orchid	165,000	MOL-Jera	MHI-Nagasaki	Aug-18	Japan	S-gas	Moss	4	US-Japan
Diamond Gas Rose	165,000	MOL-Jera	MHI-Nagasaki	Aug-18	Japan	S-gas	Moss	4	US-Japan
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



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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 Glory	165,000	Tokyo LNG Tankers	JMU	Sept-18	Japan	S	Moss	4	Various
Energy Horizon	177,000	Tokyo LNG Tankers	Kawasaki	Jul-11	Japan	S	Moss	4	Pluto LNG
Energy Liberty	165 000	MOL	JMU Tsu	Oct-18	Japan	TFDE	IHI-SPB	4	Various
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
Enshu Maru	165,257	K Line	Kawasaki	June-18	Japan	S	Moss	4	Various
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
Flex Rainbow	174,000	Flex LNG	Samsung	July-18	Marshall Is.	MEGI-DF	NO. 96 GW	4	Various
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 Genoa	174,000	GasLog	Samsung	June-18	Bermuda	TFDE	TZ Mk. III	4	Various
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 Hongkong	174,000	GasLog	Hyundai	June-18	Bermuda	TFDE	GT NO 96	4	Various
GasLog Houston	174,000	GasLog	Hyundai	Jan-18	Bermuda	TFDE	GT NO 96	4	Various
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 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
Georgiy Brusilov	172,000	Dynagas	Daewoo	June-18	Cyprus	DFDE	GT No 96	4	Yamal LNG
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

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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 Esperanza FSRU	170,000	Hoegh	Hyundai	April-18	Norway	DFDE	GTT MIII	4	Various
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
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 Juno	177,300	MOL-Osaka	Mitsubishi	Oct-18	Marshall Is.	DFDE	Moss	4	Freeport LNG/Various
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



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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
Magdala	173,400	Teekay	Daewoo	Feb-18	Bahamas	DFDE	GT No 96	4	Various
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 Spetses	174,000	Maran	Daewoo	Feb-18	Greece	DFDE	GT No 96	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
Marib Spirit	165,000	Teekay LNG	Samsung	May-08	Marshall Is.	DFDE	TZ Mk. III	4	Various
Marvel Crane	177,000	NYK-Mitsui	Mitsubishi	Mar-19	Singapore	S	Moss	4	US/Various
Marvel Eagle	155,000	MOL-Osaka	Kawasaki	Sept-18	Marshall Is.	S	Moss	4	Cameron LNG/Various
Marvel Falcon	174,000	NYK-Mitsui	Samsung	Nov-18	Singapore	DF	TZ Mk. III	4	Cameron LNG/Various
Marvel Hawk	174,000	NYK-Mitsui	Samsung	Dec-18	Singapore	DF	TZ Mk. III	4	Cameron LNG/Various
Matthew	126,540	Suez LNG Shiping	Newport News	Jun-79	Bahamas	S	TZ Mk. I	6	Atlantic LNG
Megara	173,000	Teekay	Daewoo	Oct-18	Bahama	MEGI-DF	No 96	4	Various
Mekaines	266,000	Nakilat	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	Nakilat	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

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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	Hyproc Shipping	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
Myrina	173,000	Teekay	Daewoo	Sept-18	Bahamas	MEGI-DF	No 96 GW	4	Various
Neo Energy	149,700	Tsakos	Hyundai	Feb-07	Liberia	S	GTT Mk II	4	Various
Neptune	145,000	Hoegh LNG/MOL	Samsung	Dec-09	Liberia	DFDE	TZ Mk. III	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
Noshu Maru	180,000	MOL-Jera	MHI-Nagasaki	Feb-19	Japan	S-gas	Moss	4	US-Japan
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	171,866	Hyproc Shipping	Hyundai	Mar-17	Algeria	DFDE	GTT Mk III	4	Sonatrach
Pacific Arcadia	147,200	NYK Line	MHI	Oct-14	Bahamas	S	KM	4	Various
Pacific Breeze	182,000	K Line	Kawasaki	Mar-18	Marshall Is.	DFDE	Moss	4	Ichthys LNG
Pacific Enlighten	145,000	LNG MT	Mitsubishi	Mar-09	Japan	S	Moss	4	Various
Pacific Eurys	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 Americas	174,000	Teekay	Hudong	Mar-18	Hong Kong	TFDE	No. 96 GW	4	US-Asia
Pan Asia	174,000	Teekay	Hudong-Zhonghua	July-17	Bahamas	TFDE	NO. 96 GW	4	Cheniere
Pan Europe	174,000	Teekay	Hudong	Sept-18	Hong Kong	TFDE	No. 96 GW	4	US-global
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	Hyproc Shipping	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
Rudolf Samoylovich	172,652	Teekay-CLNG	Daewoo	Oct-18	Bahamas	MEGI-DF	GT No 96	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
Sean Spirit	174,000	Teekay	Hyundai Samho	Feb-19	Bahama	MEGI-DF	No 96	4	Various
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



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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	171,866	Hyproc Shipping	Hyundai	Dec-16	Algeria	DFDE	GTT Mk III	4	Sonatrach
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
Vladimir Rusanov	172,000	MOL-China Shipping	Daewoo	Mar-18	Hong Kong	DFDE	GT No 96	4	Yamal
Vladimir Viz	172,000	MOL-China Shipping	Daewoo	Sept-18	Hong Kong	DFDE	GT No 96	4	Yamal
Wakaba Maru	125,000	J3 Consortium	Mitsui Chiba	Apr-85	Japan	S	Moss	5	Pertamina
WilForce	156,000	Teekay LNG	Daewoo	Aug-13	NIS	DFDE	GT NO 96	4	Various
WilPride	156,000	Teekay	Daewoo	June-13	NIS	DFDE	GT NO 96	4	Various
Woodside Cheney	174,000	Maran	Hyundai Samho	Mar-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
Yamal Spirit	174,000	Teekay	Hyundai Samho	Jan-19	Bahama	MEGI-DF	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

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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	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
	Dapeng ND Guangdong	CNOOC	2018	4	640,000
	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, Zhejiang	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
	Tornio	Gasum Skangas	2018	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
Gibraltar	Gasnor	Shell	2018	1	5,000
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
	Mundra	Gujarat State Petroleum, Adani Group	2018	2	320,000
	Kamarajar (Ennore), Tamil Nadu	Indian Oil, DFC, ICICI Bank	2019	2	360,000
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 Oil	2006	3	420,000

LNG Import Terminals (continued)

Country	Location (Project)	Owners	Start up	Tanks	Storage Capacity
Japan (continued)	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
	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
Panama	Costa Norte	AES	2018	1	130,000
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	5	800,000
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	Tanks	Storage Capacity
China	Shenzhen	CNPC Yudean Power	2021	2	120,000
	Yangjiang	CNPC Yudean Power	2023	2	120,000
	Zhangzhou Fujian	CNOOC	2022	2	160,000
India	FSRU Andhra Pradesh	Andhra Pradesh Gas	2019	1	135,000
	Pipovav LNG (FSRU), Gujarat	Swan Energy	2019	2	320,000
	Andhra Pradesh	Hindustan LNG, Andhra Pradesh	studies	1	135,000

LNG FSRU Import Facilities

Country	Location (Project)	Owners	Start up
Argentina	Bahia Blanca GasPort	Excelerate/YPF Repsol	2008
	Escobar GasPort	Excelerate/Enarsa	2011
Bangladesh	Moheshkhali	Excelerate, PetroBangla	2018
Brazil	Pecem, FSRU	Petrobras	2009
	Guanabara Bay FSRU	Petrobras	2009
	Salvador, Bahia FSRU	Petrobras	2013
China	Tianjin FSRU	CNOOC, Hoegh, various	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, Pertamina	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	Etiki 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	Pluto LNG expansion	Woodside	2021+	2	10.0
CANADA	Bear Head LNG, Nova Scotia	LNG Ltd.	2024	4	8.0
	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, Petronas	2024	2	12.0
	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, GEPetrol	2020+	1	2.0
INDONESIA	Sengkang LNG	Energy World Corp.	2019	4	2.0
MALAYSIA	Rotan FLNG (Sabah)	Petronas, Murphy Oil	2021	1	1.5
MOZAMBIQUE	Area 1 Onshore	Anadarko Petroleum and partners	2023+	2	10.0
	Area 4 Onshore	Eni and partners	2023+	2	10.0
	Area 4 FLNG	Eni and partners	2020	1	2.5
NIGERIA	NLNG Train 7	NNPC, Shell, Eni, Total	2022+	1	7.0
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	2023+	2	10.0
	Arctic LNG II Siberia	Novatek, Total	2023	3	19.8
USA	Alaska LNG Nikiski	Alaska Gasline Development Corp.	2023+	3	20.0
	Annova LNG, Brownsville	Exelon Corp.	2023+	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	2	9.0
	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	2019	10	2.5
	Freeport LNG, Texas	Freeport LNG	2019	4	20.4
	Galveston Bay LNG	NextDecade	2023+	6	27.0
	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.	2023+	4	8.0
	Port Arthur LNG	Sempra	2023+	2	10.0
	Rio Grande LNG	NextDecade	2023+	6	27.0
	Sabine Pass LNG, Louisiana	Cheniere	2018-19	2	9.0
	Texas LNG Brownsville	Chandra, Meyer, Samsung, others	2023+	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 m³
ABU DHABI (UAE)	Das Island (Adgas)	ADNOC, Mitsui, BP, Total	1977 1994	2 1	3.2 2.5	3	240,000
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
		(Mitsubishi/Mitsui)	2004	1	4.4	1	130,000
		NWS partners	2008	1	4.4	1	130,000
		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
		Ichthys LNG Inpex Corp., Total	2018	2	8.9	2	330,000
		Prelude FLNG Shell, Inpex, Kogas CPC	2019	1	3.5		
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	Equinor, Total, Petoro	2007	1	4.2	2	280,000
OMAN	Oman LNG	Oman Govt., Shell, Total, Korea LNG	2000	2	7.1	2	240,000
		Mitsubishi, Mitsui, Partex and Itochu					
		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	4	640,000
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	5	22.5	5	800,000
	Cove Point LNG	Dominion Energy	2017	1	5.3	7	695,000
	Cheniere Corpus Christi	Texas Cheniere	2018	1	4.5	3	480,000
YEMEN	Bal-Haf	Yemen LNG, Total, Yemen Gas, Hunt Oil, SK Group, Hyundai	2009	2	6.7	2	320,000

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