

In this issue:

- 1 **Australian outlook to 2020 sheds light on Asia-Pacific LNG demand**
Asia growth is seen in Indonesia, Malaysia, Pakistan, Singapore and Chinese Taipei
- 5 **LNG shipments head out from Gulf Coast as nation ponders shape of future market**
This next 12 months will be decision time for serious US liquefaction plant developers
- 7 **A round-up of latest events, company and industry news**
For the Record
- 22 **Germany maintains Cold War on LNG as it continues to rely greatly on Russian pipeline gas**
Germans are sole EU nation to shun large-scale LNG imports in favour of a pipeline strategy
- 24 **Class society DNV GL updates practice on metering for new LNG bunkering facilities**
Martin Layfield, DNV GL global segment leader of the Gas Value Chain
- 26 **UK LNG valve maker meets high demand for high-pressure management of fuel gas**
Duncan Gaskin looks at the cryogenic valves sector for ship propulsion
- 27 **World Carrier Fleet: Details of LNG vessels**
- 32 **Tables of import and export LNG terminals and plants worldwide**

Australian outlook to 2020 sheds light on Asia-Pacific LNG demand

Asia growth is seen in Indonesia, Malaysia, Pakistan, Singapore and Chinese Taipei

The Australian government said in its latest natural gas industry report that in contrast to the very tight market conditions over the past four years, it is expected that there will be excess supply capacity in the global LNG market until at least 2020.

This is a result of the completion of a number of new liquefaction and regasification plants currently under construction, which outweighs strong LNG demand growth.

Capacity

LNG supply capacity is expected to grow rapidly over the next five years to 2020, with global liquefaction capacity expected to reach around 550 billion cubic metres of natural gas, or 400 million tonnes per annum of LNG, an increase of 64 per cent from 2014.

This means that 230 Bcm (170 MTPA) of new capacity will be introduced into the global LNG market in the six years between 2014 through 2020, with the bulk of that from Australia and the US.

In Australia, there are seven liquefaction plants which have either recently started exporting or are currently under construction, providing a total capacity of 62.3 million tonnes:

Australia Pacific LNG, Gladstone LNG and Queensland Curtis LNG on Curtis Island in the state of Queensland have a total combined capacity of 25.3MT.

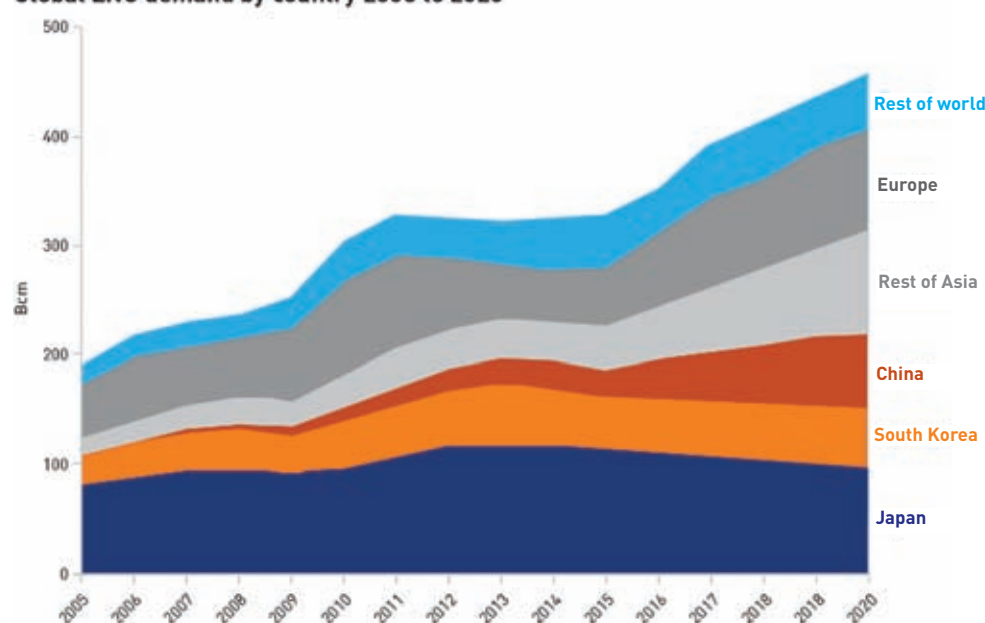
The Gorgon LNG plant on Barrow island in Western Australia, Prelude Floating LNG offshore northwest Australia and the onshore Wheatstone project have a total combined capacity of 28.1MT. Additionally, the Ichthys venture in the Northern Territory will produce 8.9MT.

Leader

By 2019-20, Australia is expected to become the world's largest LNG exporter.

Similarly, there are five liquefaction

Global LNG demand by country 2005 to 2020



Notes: Rest of Asia includes Bangladesh, Chinese Taipei, India, Indonesia, Malaysia, Pakistan, Philippines, Singapore, Thailand, and Vietnam.

Source: Department of Industry, Innovation, and Science (2015); Nexant (2015) WGM

Forecasts suggest new customers will emerge with rising production

plants under construction in the US which will be completed before 2020, with a total capacity of 62.7 MT.

They include Sabine Pass (22.5MT), Cove Point (5.3MT), Cameron (12MT), Freeport (13.9MT), and Corpus Christi (9.0MT).

Prospects

There are plans to add additional processing Trains to these project with a capacity of 9.0MT, and prospects for even greater capacity to be constructed in the US.

New demand growth will be led by China, the rest of Asia and Europe.

Global LNG demand is expected to grow strongly to 2020 to approximately 457 Bcm (336MT), an annual increase of 5.9 per cent from 2014.

"This growth is led by China, the rest of Asia and Europe, offset by falling demand in Japan," the Australian report said.

"Demand growth has softened recently but the prospects remain positive overall. Demand in Japan has reached its peak

and is expected to decline over the medium term, due to the restart of nuclear power plants and strong competition from alternative energy sources in electricity generation.

"Nevertheless, Japan is still expected to remain the largest single importer of LNG, accounting for over 20 per cent of global LNG demand by 2020 (100 Bcm or 73.5 MTPA)," it added.

The report is broadly consistent with the International Energy Agency perspective on the future trend of natural gas demand in Japan.

South Korea, currently the second-largest importer, is expected to be overtaken by China, and will become the third-largest single importer by 2020.

"Gas has an important role in the energy mix in China, and will continue to grow given the Chinese government's aim to increase the share of gas from 5 to 10 per cent of total energy consumption by 2020," the Australians said.

"The Chinese government is promoting gas to improve urban air

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quality, and as a means to increase energy security,” the report added.

Projections

In line with the projections from the IEA's World Energy Outlook 2015, total gas demand in China is expected to increase to 310 Bcm by 2020, from 178 Bcm in 2014, a growth rate of 9.7 per cent a year.

As a consequence, Chinese LNG demand is projected to triple to 69 Bcm by 2020, although this is lower than previous estimates because of increasing competition from pipeline supplies from Russia and Central Asia.

“Europe is expected to make a strong recovery in LNG demand by 2020, growing at 12.3 percent a year from 2014, which is effectively returning to earlier demand levels.

“This strong growth occurs despite the poor prospects for growth in overall gas demand in Europe, a consequence of a poor economic outlook, and continued penetration of renewables in the energy mix.

“The growth in LNG imports is primarily the result of falling indigenous production (particularly in the Netherlands) and a desire to diversify from dominant Russian pipeline supply,” it said.

LNG demand is also expected to grow strongly in the rest of Asia to 95 Bcm by 2020, and will exceed imports into China by this date.

Spread

“Imports are spread across a large number of countries. India is expected to be the engine of demand growth, with LNG demand likely to triple by 2020 to reach 37.5 Bcm, from 13 Bcm in 2010.

“Nearly half of India's total gas demand is expected to be supplied by LNG. This is a result of the poor outlook for indigenous production, and limited prospects for international pipeline imports due to geopolitical and economic factors,” the Australian report said.

While the outlook for India is positive, forecasts for both LNG and overall gas demand in India vary greatly.

“There are many barriers to greater gas penetration in the Indian market.

“For example, the domestic market is very sensitive to price and competition from alternative energy sources, and gas distribution infrastructure must be expanded significantly.

Consumption

“The forecasts in this report are for larger volumes of gas and LNG consumption in India by 2020 than projected by the IEA in its 2015 World Energy Outlook, however the forecasts converge again by 2030,” it said.

“Among the other countries in the rest of Asia, the main growth in LNG demand is expected in Chinese Taipei, Indonesia, Malaysia, Pakistan, and Singapore.

“This growth is driven by a range of county-specific factors. In Indonesia and Malaysia, gas demand in the eastern provinces is distant from the offshore gas reserves in the west, which increases their reliance on LNG imports.

“This in turn makes less gas available via pipeline to Singapore and increases its reliance on LNG.

“Pakistan's gas demand is expected to increase rapidly as a result of the expansion of gas-fired electricity generation, and LNG imports will fill the gap between overall gas demand and falling indigenous production,” the

report added. “A key observation from this forecast of LNG demand is that it relies on growth in a large number of smaller importers. The growing numbers of LNG importers, each with a relatively small market share in the rest of Asia will accelerate market fragmentation and at the same time support increasing competition and liquidity in global LNG markets.

Uncertainties

“Demand growth going forward is subject to many uncertain influences. One of the key uncertainties is Japan's nuclear restart schedule and ongoing energy diversification policy.

“Two nuclear power plants - Sendai 1 and 2 - have resumed commercial operations in 2015, in line with the Japanese government's aims to supply 20 to 22 per cent of total electricity generation from nuclear power by 2030.

“However the scope and timing of restarts for the remaining nuclear power plants is uncertain. This, together with strong support for renewables and further improvements in energy efficiency, creates a downside risk for LNG demand in Japan,” the report said.

As outlined previously, Chinese and Indian LNG demand growth is also uncertain, and will depend on the relevant energy policies in each country and the extent to which growth in domestic production can be achieved, in particular the prospects for shale gas in China.

“In spite of China's large recoverable shale-gas resources and supportive government policies, there are significant barriers to a rapid expansion of shale-gas production.

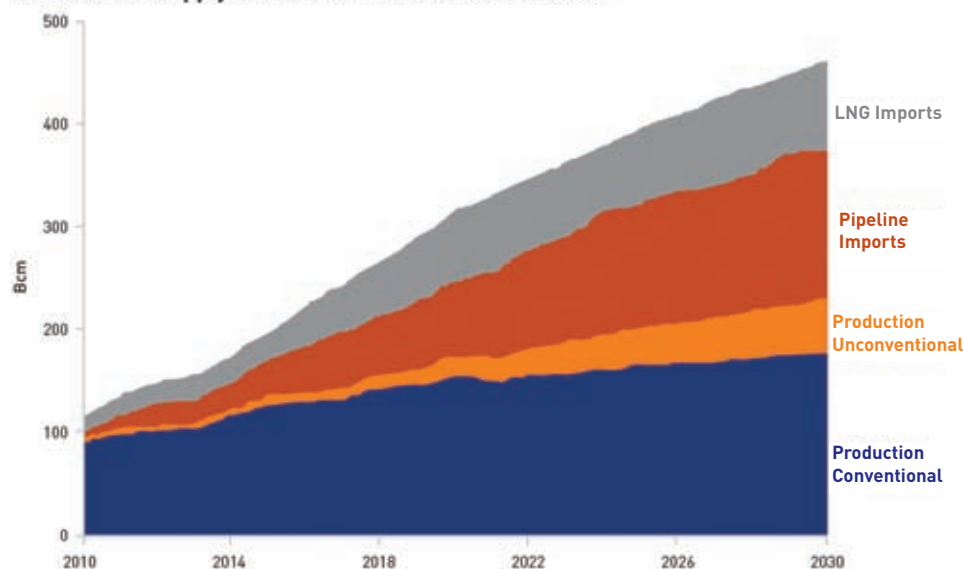
“These include the regulatory structure of the gas sector in relation to pricing and pipeline access, as well as geological aspects such as difficult terrain for intensive drilling, high drilling costs as a result of longer drilling times, and water availability.

Revision

“The Chinese government revised down its 2020 target for shale-gas output from 60 to 100 Bcm to 30 Bcm. There are concerns, noted in the IEA's World Energy Outlook 2015, that even this revised 2020 target is ambitious.

“This report projects unconventional gas production of only 18 Bcm in 2020, growing to 50 Bcm by 2030. If these reduced targets are not achieved, there are prospects for higher LNG imports

Chinese LNG supply and demand balance 2010 to 2030



Source: Department of Industry, Innovation, and Science (2015); Nexant (2015) WGM

Forecast of China's natural gas demand mix through to 2030



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than forecast in this report,” the Australians said.

The extent of shale-gas production in Europe is also unclear, as is their ability to diversify away from Russian pipeline imports, and the future positioning of gas in relation to alternative energy sources.

Environmental policies including greenhouse gas mitigation will have important implications for the future energy mix.

“These uncertainties are likely to result in continued growth in the LNG spot market. Buyers will be reluctant to enter into long-term contracts if they are unsure of the future supply and demand for gas, and they are likely to rely on the shorter term market to secure their immediate needs.

“These uncertainties will be heightened by the fact that the main expansion of LNG demand will be in countries which can access alternative sources of gas supply.

Opportunity

“These countries have the opportunity to use LNG as the balancing item in overall

gas supply, and hence LNG demand will be more variable over time,” the report said.

The weight of the Middle East and North Africa countries in the global LNG market strengthened and the region emerged as a new growth driver.

Last year, the five importing MENA countries received close to 10MT of LNG against only 4.1MT in 2014, a rise of over 140 percent, according to a report from Cedigaz, the France-based consultants and information organization that publishes analyses and surveys of the energy sector.

The growth was fuelled by new importers Egypt and Jordan, which procured respectively 2.7MT of cargoes and 1.7MT of cargoes for Floating Storage and Regasification Units moored in their Red Sea ports of Ain Sokhna and Aqaba.

The bulk of the cargoes for the Arab nations were supplied by Qatar (2.1MT) and Nigeria (0.6MT).

Traditional LNG buyers in the Gulf region, Dubai and Kuwait, also contributed strongly to the growth, with imports up 61 percent and 20 percent

respectively to 2.5MT and 3MT. Cedigaz said imports “remained stable” in Israel with only one cargo received, as in 2014.

According to Cedigaz’s estimates, overall LNG imports grew by 2.1 percent in 2015 to 241.2MT.

Other markets

“Main highlights include the reversal of growth trends in Asia and in Europe, the emerging role of the MENA countries as LNG importers and the growth of intraregional and intra-basin trade due to the convergence of global prices,” the report said.

“After many years of growing demand in Asia and declining demand in Europe, trends changed on the two largest LNG markets in 2015,” it said.

Cedigaz said European LNG net imports grew by 10.2 percent in 2015 to 37MT after three years of continuous decline, but remained far below the peak level of above 65MT reached in 2010 and 2011.

“Except in France, where net imports declined to 4.3MT and in Greece where imports were flat at around 0.4MT,

LNG net imports increased everywhere because of various factors,” the report said.

“In the Iberian peninsula, LNG demand was boosted by the power sector as a summer heatwave increased air conditioning demand while droughts reduced the availability of hydropower.

“In Northwest Europe, where gas markets are more liquid than in other parts of the region, LNG net imports grew significantly as large portfolio owners, including Qatar, diverted LNG to limit oversupply in Asia,” it said.

In the UK, where the South Hook terminal received about 20 percent more LNG (all coming from Qatar), net imports grew to 9.4MT and in Belgium and in the Netherlands net imports grew respectively to 2MT and 700,000 tonnes. ■

This article contains extracts from the latest “Gas Report” from the Australian Government’s Office of the Chief Economist and from a report by France’s Cedigaz.



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LNG shipments head out from Gulf Coast as nation ponders shape of future market

This next 12 months will be decision time for serious US liquefaction plant developers

The first export shipment of liquefied natural gas produced in the Lower 48 states left the Gulf Coast of Louisiana on February 24 and was the result of a decade of natural gas production growth that has put the United States in a new position in the worldwide energy trade.

With the rapid growth of supply from shale-gas resources over the past decade, US natural gas production has grown each year since 2006.

The resulting decline in domestic natural gas prices has led to rising natural gas exports, both via pipeline to Mexico and since February 2016 to overseas markets via LNG tankers.

Still importer

The US is currently a net importer of natural gas, and gross imports represented nearly 10 percent of total supply in 2015, based on data through November 2015.

The US imported 7.5 billion cubic feet per day (Bcf/d) of natural gas, mostly from Canada by pipeline, and exported 4.8 Bcf/d, mostly to Mexico by pipeline.

For years, Alaska has exported LNG, mostly to Pacific Rim countries, but these volumes have been small.

In addition to the Sabine Pass terminal that was the source of the February 2016 LNG shipment to Brazil, four other LNG export terminals are currently under construction.

The US Energy Information Administration noted in a recent report that the US Gulf Coast has a large existing pipeline network, which makes the area attractive for

developing LNG export plants. "Many of the LNG export terminals now under construction or proposed are at sites that have functioned, and may continue to function, as LNG import terminals.

"Several LNG import terminals were built in the 1970s, and a new wave of terminals was constructed in the mid- to late-2000s.

"As domestic production increased, LNG imports declined, as many new terminals were barely used and the utilization rates of older terminals declined," the EIA said.

The Federal Energy Regulatory Commission (FERC) is responsible for authorizing siting and construction of LNG export terminals (as well as import terminals) that are onshore or that are close to the shore.

FERC prepares environmental impact statements to assess the environmental consequences of the terminals under its jurisdiction.

Although most of the LNG terminals fall under the FERC's jurisdiction, the US Maritime Administration regulates deepwater terminals.

Deepwater exports

Only one deepwater export terminal has been proposed, and if approved, it would be located about 50 miles south of the Texas-Louisiana border in the Gulf of Mexico.

In addition to approval for construction from FERC or the Maritime Administration, the US Department of Energy's Office of Fossil Energy issues separate authorizations to export to countries based on whether they have a Free Trade Agreement or not with the US.

Cheniere Energy's newly on stream Sabine Pass liquefaction plant will consist of six different liquefaction units, or Trains, when completed in several years.

The other Trains are in various stages of development and permitting. Total permitted capacity by FERC is 4.16 Bcf/d.



US exports began when 'Asia Vision' departed Sabine Pass for Brazil

Four LNG export terminals are currently under construction:

- Dominion Energy's Cove Point LNG facility in Cove Point, Maryland, is scheduled to bring one Train totalling 0.82 Bcf/d on stream near the end of 2017.
 - Corpus Christi LNG, another Cheniere project, is under construction in Corpus Christi, Texas. The terminal is scheduled to begin service in 2018, with total permitted capacity at 2.14 Bcf/d.
 - Sempra Energy's Cameron LNG terminal, located in Hackberry, Louisiana, is under construction and is scheduled to bring three Trains online in 2018. A total of 1.7 Bcf/d has been permitted.
 - Freeport LNG's terminal planned for Freeport, Texas, has three Trains under construction totalling 1.8 Bcf/d. The first two are scheduled to begin service in 2019, and the third in 2020.
- Another terminal, Southern Union's Lake Charles (Louisiana) LNG facility, has been approved by the FERC but is not yet under construction.

Lake Charles also has an LNG import terminal. Several more LNG export terminals, mostly on the Gulf Coast, have been proposed or have pending applications with the FERC.

Shale feed-gas

The new US LNG export plants are expected to take advantage of natural gas produced in the Appalachian Basin, particularly the Marcellus and Utica regions, the source of much of the nation's production growth over the past several years.

The Sabine Pass Liquefaction project has secured 300 million cubic feet per day (MMcf/d) of natural gas from the Texas Gas Transmission Ohio-Louisiana Access Project, which facilitates additional flows of Marcellus and Utica natural gas to the southern United States.

Additionally, Cheniere's Corpus Christi Liquefaction project will receive 385 MMcf/d from the Natural Gas Pipeline Company of America's Gulf Coast mainline pipeline system.

Cove Point

Dominion's Cove Point (which began operating as an import terminal in 1978) already has a dedicated pipeline with a link to three interstate pipelines that operate in the Marcellus area.

However, market conditions have changed since many LNG export projects in the US were initially proposed.

Proposed LNG export plants in the US face not only increased competition from other domestic and foreign plants that have been completed, but they also face uncertainty in global LNG demand.

Australia, already a major LNG exporter, plans to expand its LNG export capacity in the coming years.

In late 2015, two more plants began service in Australia, Gladstone LNG and Australia Pacific LNG, both located on Australia's East Coast. That followed the coming on stream at the end of 2014 of the Queensland Curtis LNG plant.

These three Australian plants are the first of an industrial scale to process coal-seam gas into LNG.

The Gorgon LNG export project on Barrow Island off Western Australia, a traditional plant using offshore gas and

The decline in domestic natural gas prices has led to rising natural gas exports to overseas markets

operated by Chevron Corp., began shipping cargoes in the first quarter of 2016.

One issue raised on the new US LNG export industry is what effect Russia can have on its success with pipeline natural gas competition in Europe.

The conclusion is that US LNG export volumes are more likely to feel pressure from domestic feed-gas prices as well as the crude oil and coal markets rather than any actions taken in Europe by Russia and its competing pipeline supplies.

That's the view of analysts at energy consultants Wood Mackenzie, who counter the idea that Russia would try and mimic Saudi Arabia on oil by pushing pipeline natural gas supplies to Europe to such a low level that US LNG production would be uneconomic.

Gazprom challenge

"With European LNG imports, including from the US, set to grow over the next five years, there is much speculation about Russia's likely response," said Stephen O'Rourke, Research Director of Global Gas Supply for Wood Mackenzie.

He questions whether Russia's gas

strategy would seek to retain market share in Europe by pushing European gas prices to levels that would force the US to shut down its feed-gas rather than sell to Europe at a low price or a loss.

The consultants said US LNG export utilisation "will be determined by multiple factors" and a large proportion of export volumes "will be under threat" at times over the next five years and from various sources.

Noel Tomnay, Head of Global Gas & LNG research for Wood Mackenzie said: "Our analysis shows that while Russia's export strategy is important, ultimately US LNG export utilisation will be influenced more by the price of other commodities: of US gas, oil and, particularly, of coal, which will determine European spot prices through coal-gas switching in the power sector."

Wood Mackenzie's O'Rourke said that using the consultants' Global Gas Model, the firm explored the impact of three determinants on US LNG exports: Russia's gas export strategy, oil price and coal price.

This addressed three issues such as the level of coal prices, oil staying at

current prices and Russian natural gas company Gazprom increasing or decreasing its pipeline exports to Europe.

Oil direction

"Should oil prices remain low, Russian oil-indexed contract gas will remain cheap and buyers will maximise their offtake of Russian gas," said O'Rourke.

"At low oil prices, customer choice rather than strategic Russian decision-making would allow Russia to retain over 30 percent of the circa 490 Bcm European market and threaten US LNG export volumes.

"If coal prices also remain low, monthly European gas prices could fall to US\$3.85 per million British thermal units and utilisation of US LNG export capacity could average 85 percent between 2017-2020," the analyst stated.

The report said that if the oil price was to rise then Russia's share of the European market stands to decline to only 25 percent if the price of oil and Russian contract gas rise.

"Russia could elect to make more pipe gas available at spot prices and increase

market share to as much as 35 percent, but in so doing European spot prices could fall towards \$3 per MMBtu for longer periods," it added.

Wood Mackenzie says that such a market share strategy could reduce US LNG export utilisation to some 40 percent and would send a strong signal to deter developers of future US LNG export projects.

"But while it could maximise profitability for Russia under some oil and coal price combinations, it seems an unrealistic outcome," O'Rourke said.

"In addition to undermining existing contractual supply agreements, securing additional pipeline access for export volumes would require the tacit support of Ukraine and the European Union, a dependence that appears politically challenging," O'Rourke stated.

"Russia's export strategy will be a key determinant of US LNG export capacity utilisation, but the Russian pursuit of European market share to drive out US LNG from Europe seems either uneconomic and/or impractical under different external conditions," the report concluded. ■

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For the Record

ABB, the Swiss power technology group, has won a five-year contract to deliver equipment and services for the Royal Dutch Shell Prelude Floating LNG hull to be deployed offshore northwest Australia. ABB said the order includes the delivery of motors, generators, variable speed drives and low-voltage switchgear as well as service and support for motors from third-party vendors. Once towed to its offshore Australian location from the Samsung Heavy Industries shipyard in South Korea, the Prelude FLNG hull will be attached to the underwater infrastructure in the Browse Basin. It is scheduled to remain there for up to 25 years without uncoupling for overhaul, or to take shelter from cyclones. The ABB electrical system will power 14 gas plant modules, allowing the facility to produce 5.3 million tonnes per annum of LNG. The Zurich-based company will additionally build up a spare parts inventory, workshop repairs, training and provide technical support for the project. “A reliable service network is crucial for the facility’s productivity,” said Pekka Tiitinen, a senior executive at ABB’s automation division. “Prelude will be equipped with ABB’s integrated marine solutions for optimal reliability, flexibility and energy efficiency to assure higher profitability,” added Tiitinen. ABB has previously won a contract to supply the electrical system for other FLNG production plant being developed by Malaysian energy company Petronas. Petronas is developing two FLNG projects in Malaysian waters. The contract was awarded by principal engineers on the venture, Japan’s JGC Corp., part of a consortium that is building the PFLNG1 facility for Petronas, also at Samsung in Korea. The start-up of the Petronas FLNG liquefaction facility over a stranded gas field is scheduled for later in 2016 and will be the first in the world to go into operation.

ALASKA LNG plans to start submitting its second round of draft resource reports to federal regulators in the second quarter of 2016 as spending on the venture so far reaches \$700 million. About a dozen environmental and

engineering reports will be compiled and submitted to the Federal Energy Regulatory Commission by July of 2016 and then later made available to the public. According to minutes of meetings held between Alaska LNG and FERC officials the reports will cover issues such as soil conditions, air quality, water quality, community impacts and safety. Project partners ExxonMobil, BP and ConocoPhillips and the state’s Alaska Gasline Development Corp., are aiming to construct three liquefaction Trains at Nikiski to process up to 20 million tonnes per annum of LNG and with three 160,000 cubic metres capacity storage tanks alongside. Current proposals for delivering the gas from the prolific North Slope onshore gas fields are to use an 800-mile, 42-inches diameter pipeline with up to eight compressor stations along the way. The pipeline will have a capacity of 3.3 billion cubic feet of Alaska natural gas per day to the plant in the south. The four project partners have been carrying out preliminary engineering and design work on aspects of the liquefaction plant and storage facilities, as well as the pipeline. This additional information will be forwarded to the FERC. Though weak global LNG markets have called into question whether the Alaska project will proceed to the next level of engineering and design spending through 2017, the partners have said they remain committed to finishing their preliminary work this year and preparing the next round of reports to be submitted to the FERC. “Alaska LNG project teams and their contractors will be back in the field this year for onshore and offshore work as they collect more data for regulators and their own design and decision needs,” according to the mayor’s office for Alaska’s Kenai Peninsula. “The partners spent almost \$500 million from 2012 through 2015, including three summers of field work. They approved a work plan of more than \$200M for this year. The project’s full budget, through construction, was estimated in 2012 at \$45 billion to \$65Bln,” the statement added. The new reports to the FERC will give the public their most detailed information yet on the contraction plans for the Point Thomson-to-Prudhoe Bay gas pipeline, the North Slope gas treatment plant, the Prudhoe Bay-to-Nikiski pipeline and liquefaction plant and marine export terminal to be built at Nikiski. “The other filings expected in late spring, require the partners to set out alternatives to the project, discussing the other options for moving North Slope

gas to market. Discussing alternatives is required for every federal environmental impact statement, and Alaska LNG is no exception,” the statement explained. “One option long championed by many Alaskans would be to route the pipeline to Valdez, site of the trans-Alaska oil pipeline terminal, instead of Nikiski. Several public comments submitted to FERC last year raised that issue. Alaska LNG will be required to explain why it did not select Valdez for the liquefaction plant and marine terminal, just as it will explain why it rejected other sites around Cook Inlet and Prince William Sound,” it added.

AMERICA LNG, a project in Florida controlled by an equity fund and one of seven fully approved LNG export ventures in the US, has made progress with its plan to export volumes to the Caribbean nation of Jamaica, which does not have a Free Trade Agreement with the US. It will additionally supply LNG as a fuel to replace diesel for some of the upgraded locomotives of the Florida East Coast Railway. Based on a review, the Department of Energy has issued a statement saying it had concluded that the opponents of American LNG’s application to export LNG from its facility to Non-Free Trade Agreement nations “have not demonstrated that the requested authorization will be inconsistent with the public interest”. The DoE added that the exports proposed in the application were likely to yield net economic benefits to the US. “The DoE further finds that American LNG’s proposed exports should be authorized at a volumetric rate not to exceed the capacity of the facilities to be used in the proposed export operations,” it said. American LNG’s permit is therefore confirmed for exports from the small facility near Miami. The shipments will be made in ISO containers to non-free trade agreement nations. American LNG asked for permission to export up to 3.02 billion cubic feet per annum from its facility, located on the northern portion of the Hialeah Railyard in Medley, Florida. The liquefaction plant is characterized by American LNG as a “micro-LNG facility. It anticipates that the Hialeah facility will have a total production capacity of 100,000 gallons of LNG per day, or 8.26 million cubic feet of natural gas per day. The project will also provide storage capacity for around 270,000 gallons of LNG. The development company is controlled by Fortress Equity Partners, part of the Fortress Investment Group, a

global asset firm. New Fortress in 2015 signed a natural gas supply accord with Jamaica Public Service Co. to provide LNG for the power company’s 120-megawatts Bogue power plant in western Jamaica, at Montego Bay. The Jamaican power plant is currently being converted to run on natural gas instead of diesel. “The ISO containers designated for delivery to export customers will be loaded onto container ships or ocean-going carriers at the nearby Port of Miami or other ports in Florida,” the DoE was told. American LNG said the likely destinations of all its exports would be the nations in the Caribbean and Central American regions. The company also said its LNG would have domestic customers, including the local railroad company. American LNG states that it has executed a long-term off-take agreement with the Florida East Coast Railway for a significant percentage of the LNG production capacity of the Hialeah facility. The railway company intends to use the LNG to fuel a portion of its locomotive fleet as part of a fleet modernization program, which will create significant benefits associated with substituting LNG for diesel fuel. American LNG states that the Hialeah plant will receive feed-gas from the domestic natural gas supply market through an interconnection constructed by Florida Gas Transmission.

ANADARKO, the US energy company, expects minimal funding on the Mozambique LNG project during 2016 as it works three parallel paths towards a final investment decision for its onshore liquefaction plant at Pemba in the southeast African country. “These processes include securing the necessary legal and contractual framework, progressing more than 8 million tonnes per annum of off-take toward long-term sales contracts and advancing project financing,” Anadarko said. The company budget for all onshore activities would be cut by almost \$2.5 billion and it planned to sell \$3Bln of assets to weather the oil price storm. The US company said 2016 capital expenditure would be a maximum \$2.8Bln, almost 50 percent lower than last year. Nearly half of those investments are earmarked for its highest-returning onshore US plays, Delaware and Denver-Julesburg basins. “We intend this year to continue to improve our credit story and doing it without diluting our equity story,” said Anadarko Chief Executive Al Walker. Anadarko and its partners in

Mozambique's Offshore Area 1 licence concluded their competitive front-end engineering and design process in May 2015 by selecting CB&I of the US, Japan's Chiyoda Corp. and Saipem of Italy for the project. The scope of the work for the onshore LNG complex at the coastal town of Pemba includes two LNG Trains, each with capacity of 6 million tonnes per annum. The original concept envisaged 10 Trains each with 5 MTPA and a total output of 50 MTPA. There is sufficient feed-gas to expand the scale over time, analysts said. The project will help take the southeast African nation from being among the world's poorest countries to among the front-rank of LNG producers. The Area 1 shareholders have at least 75 trillion cubic feet of feed-gas while the nearby Area 4 licence holders, led by Italy's Eni, have a similar amount of resources. Eni for its part is focusing on two Floating LNG projects offshore and is moving forward with one of them, the Coral FLNG project. Eni said in its February 26 earnings report that the Mozambique authorities had sanctioned the development of Coral FLNG. "In February 2016, Mozambique authorities sanctioned the development of the first phase of Coral to put into production 140 billion cubic metres of gas," Eni said. This follows the signing of a unitization and operating agreement by the two licence holders in the Rovuma Basin, offshore Mozambique, to cover gas straddling both licences for Eni's Area 4 and Anadarko's Area 1. In accordance with the agreement, the development of the straddling reservoirs will be carried out at an early stage "in a separate but coordinated way by the two operators" until 24 TCF of natural gas reserves are developed, 12 Tcf from each. The final investment decision relating to the Mamba field and Coral FLNG in Eni's operating Area is expected in 2017.

BRITISH COLUMBIA has introduced amendments that will streamline safety oversight for oil and gas facilities, including liquefied natural gas plants. The province's Minister of Natural Gas Development, Rich Coleman, has presented a bill to clarify the regulatory regime oversight at oil and gas facilities to ensure equipment is covered by the highest safety standards. The amendments are intended to eliminate overlaps and potential gaps as large-scale projects such as LNG ventures and feed-gas developments in the shale-gas basins of northeast BC move forward. "These

amendments are about having the best safety standards in place, while clarifying the regulatory environment for industry," said Coleman. "As our province sees larger-scale projects move forward, this legislation will ensure all equipment used in oil and gas settings will be subject to the highest standards," he added. The best regulations will be applied to ensure that complex refrigeration associated with LNG production is covered. There are two agencies responsible and the act outlines the duties of each. The BC Oil and Gas Commission (OGC) is responsible for the safety of oil and gas operations under the Oil and Gas Activities Act. The BC Safety Authority (BCSA) provides oversight of technical equipment in industries throughout the province under the Safety Standards Act. The move comes as the Petronas-led Pacific NorthWest LNG project, one of the most high-profile of the dozen that may advance in the province, comes to the end of a three-year environmental review process. "We are continuing to move that forward and we believe we are in the latter stages of a final decision," said Michael Culbert, President of the Pacific NorthWest venture. The project is owned by Petronas, along with China's Sinopec, Japan Petroleum Exploration Co., India Oil Corp. and Petroleum Brunei. The shareholders will decide whether to go ahead after reviewing the economics and the mitigation conditions imposed by regulators, as well as new hurdles erected to meet federal Prime Minister Justin Trudeau's climate-change priorities.

CHEVRON Corp. has shipped its first cargo from the Gorgon LNG plant on Barrow Island off the northwest coast of Western Australia destined for one of the US major's foundation buyers, the Japanese utility Chubu Electric Power. The LNG cargo was delivered by the 160,000 cubic metres capacity Chevron-owned carrier "Asia Excellence". Chevron is the operator of Gorgon with a 50 percent interest while Australian subsidiaries of Royal Dutch Shell and ExxonMobil each hold a 25 percent stake. "To support Chevron's growing position as a leading LNG supplier, Chevron Shipping Company is in the final stages of its largest shipbuilding and fleet modernization program in recent history, which includes the addition of six new LNG carriers to its operated fleet," Chevron said in making the announcement. Mike Wirth, Executive Vice President of Chevron Midstream and

Development, said: "This is also important for our investors as we begin to generate revenue from a project we expect will operate for decades to come." Chevron stated that LNG was "an essential fuel for power generation across Asia" and natural gas is among the fastest growing segments of Chevron's energy portfolio. The Gorgon project is supplied with feed-gas from the Gorgon and Jansz-Lo gas fields, located within the Greater Gorgon area, up to 136 miles (220km) off the northwest coast. That includes the liquefaction plant and its 15.6 million tonnes per annum of output on Barrow Island, as well as a carbon-dioxide injection project and a domestic gas plant to supply the Western Australia market. With the commercial start-up, the Gorgon venture is a year behind schedule and well over budget, because of its complexity as a construction project and the environmental challenges. The original budget for Gorgon was \$US37Bln when it was first given the go-ahead and costs have risen by US\$17Bln to US\$54Bln. The Gorgon joint venture partners also have a permit for a fourth Train expansion, improving the long-term project economics with 5.2 MTPA of additional cargoes. Constructing the fourth Train would also increase the final spending bill as it would involve drilling new production wells, extra subsea infrastructure offshore as well as construction of the Train itself and associated infrastructure on Barrow Island. Chevron is also developing the Wheatstone project and a domestic gas operation near Onslow, in the Pilbara region of Western Australia. "Chevron's Australian projects are well located to supply natural gas for the region and more than 80 percent of Chevron's LNG from the Gorgon and Wheatstone projects is covered by sales agreements with customers in the Asia-Pacific region," the US company said. That Wheatstone venture, with Australia's Woodside as a partner, will have an initial capacity of 8.9 MTPA of LNG and is expected to come on stream by 2018.

CLARKSONS, the UK shipping brokerage which last year completed the takeover of Norwegian broker and investment bank Platou ASA, reported a 9 percent drop in earnings per share amid "unprecedented challenges" in 2015, though with building blocks in place for a more positive market. The results in 2015 included 11 months contribution from the Norwegian brokerage and underlying

profit before taxation was 50.5 million pounds (\$71.6M) compared with 33.8M pounds in 2014. However, underlying earnings per share dropped to 121.9 pence in 2015 from 134.2 pence the previous year. The EPS was before exceptional items and acquisition costs of 18.7M pounds in 2015 and 8.6M in 2014. In addition to its brokerage activities, Clarksons also provides research and analysis of shipping markets, including the LNG sector. Clarksons Chief Executive Andi Case said the offshore sector had experienced the most difficult environment, whereas significant movements in commodity prices changed trade flows, creating "both positive and negative impacts" to shipping demand as the volatility has played out. "Once again, seaborne trade grew in 2015. However, the primary concern remains the oversupply of tonnage in a number of the shipping markets, combined with the additional challenge of debt and equity funding increasingly witnessed across the global shipping industry," Case stated. "The geopolitical and macro-economic environment remains very uncertain and, as such, we do not anticipate any changes to our markets in the near term. However our business model has proven to be robust and the strategic advances we have made in 2015, coupled with our strong balance sheet, ensure that we are 'fit for the future'. As we continue to see building blocks for the creation of healthier shipping markets, we feel best placed to capitalise on new opportunities," the Clarksons CEO said. Clarksons completed the acquisition of the offshore and shipping market player Platou in February 2015. "Through this acquisition we have combined two leading businesses and highly experienced and proven management teams to create a fully integrated offer across shipping and offshore, broking and banking. The board firmly believes that this deal sets new standards in the broking industry. The integration of our two businesses has continued at great pace over the course of the year and is now effectively complete," Clarksons said. The company said research and analysis continued to play a crucial role in underpinning its offer to clients. "We are the industry's leading provider of data and market intelligence on the shipping and offshore industries and our trusted research team is by far the largest commercially-led unit in the maritime world. Despite the challenging markets, the increasing strength of our research business reflects the importance

we and our clients place on this valuable market insight," it added.

CLEAN ENERGY Fuels Corp. the US LNG and fuel company, saw a surge in volumes as revenue declined. The US builder of natural gas filling stations and a fuel supplier to the trucking industry delivered 308.5 million gallons last year, a more than 16 percent surge from the 265 million gallons sold the previous year. Clean Energy said in its latest results that it delivered 78.3 million gallons in the fourth quarter, an increase of more than 8 percent from the prior-year period. Revenue for the fourth quarter of 2015 was \$119.3 million, a 9.7 percent decrease from \$132.1M in the same three months of 2014. Income in the quarter included \$31M in excise tax credits for alternative fuels (VETC) and overall revenue totalled \$384.3M for the year, down 10.4 percent. Natural gas fuels in the US like LNG cost up to \$1.00 less than gasoline or diesel, depending on local market conditions. "The revenue decreases in the fourth quarter and year were primarily due to the lower cost of natural gas, continued softness in the company's global compressor business due to low oil prices and a strong US dollar," said Clean Energy, listed on the Nasdaq stock exchange. The company, based in Newport Beach, California, supplies liquefied natural gas, compressed natural gas and bio-methane as trucking and transport fuel. The forerunner company of Clean Energy was Pickens Fuel Corp., founded by US oil tycoon and LNG-fuel pioneer T. Boone Pickens. "We continue to make progress and improve our results in a tough low oil price market," said Andrew J. Littlefair, Clean Energy's

President and Chief Executive. "Year-over-year we experienced double digit volume growth. We are encouraged by the many bright spots in our business, including the

more than 100 percent increase in our Redeem renewable natural gas volumes in 2015," Littlefair said. The company in 2013 launched its bioethane natural gas fuel

Redeem. The methane gas is marketed as fuel for heavy duty trucks, refuse trucks, transit and airport service vehicles. Clean Energy supplies Redeem at public-access

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stations in California, and has recently expanded its Redeem sales into Oregon and Texas. “We continue to leverage our natural gas fueling infrastructure and solid foundation of recurring volumes while remaining focused on our capital structure as evidenced by our recent reduction in our convertible debt by \$92.5M,” the CEO said. The company also has contracted commercial customers. In California, for example, Clean Energy supplies transportation fuel to clients such as the US Postal Service, Republic Services, the City of Santa Monica’s Big Blue Bus and the University of California San Diego.

CROWLEY, the US shipping group Crowley has applied to the Canadian National Energy Board for an export permit to ship LNG south by truck, barge or ship from small-scale liquefaction plants currently operating or being expanded in Canada. Crowley has filed an application with the NEB for its LNG unit to export up to 10 billion cubic feet per annum for 25 years to the US and its territories. The US company said the LNG would be provided by Tilbury plant in the town of Delta, British Columbia, or the Mount Hayes plant on Vancouver Island, both owned by FortisBC Energy Inc. “LNG for export may also be sourced from the Elmworth LNG Plant in Alberta, which is owned by Ferus Natural Gas Fuels,” Crowley said. “The LNG may be exported via vessel or containers loaded onto trucks or barges,” it added. While large-scale Canadian LNG export projects have been stalled or delayed, there are several plants originally started as peak-shaving facilities and which are now being expanded for domestic retail and commercial sales. Crowley’s petroleum distribution unit has already been granted authority by the US Department of Energy to import LNG shipments from Canada. The company is also a main established provider of marine and road petroleum and fuel distribution and energy support services throughout Alaska. The Crowley company is part of the group that owns Crowley Maritime Corp., based in Jacksonville, Florida. Crowley is separately having LNG-fueled vessels constructed for its trade routes to the US territory of Puerto Rico and to supply LNG in containers for use as fuel. The company’s Canadian permit will allow it to ship LNG from the loading area at any marine cargo terminal in the metropolitan areas of British Columbia. It will also permit land border-crossings

by LNG trucks between BC and Washington State, BC and Alaska or between the Yukon and Alaska. Crowley noted in its application that the Tilbury LNG plant has a production capacity of around 5 million cubic feet per day of natural gas and is being expanded. LNG is currently produced at Tilbury for sale in both local BC markets and regional markets and for utility peak-shaving services to enhance local gas distribution system reliability.

ENDESA, the Spanish energy company, is building up its liquefied natural gas fueling business and has just opened up a new station to service several more towns in Spain. Endesa, which is active in the generation, transmission and distribution of electricity in Spain, Portugal and North Africa, is also a major operator in the natural gas market and other energy businesses. The new Endesa public service station is located in the town of Valdemoro, about 30 kilometres south of Madrid, and will supply LNG for buses, trucks and cars as well as compressed natural gas (CNG). Endesa said its latest gas station is public and will supply both fuel forms for vehicles. Spain is currently the biggest user of LNG in Europe and has seven import terminals, mainly to supply its gas-fired power plants. “With this gas fuel station in Valdemoro, Endesa will have five stations working over the next few months as part of the company’s natural gas vehicle development plan implemented in Spain and France,” the company stated. Endesa opened its first natural gas fueling station for vehicles in the Balearic Islands, in Palma de Mallorca. Then, in 2015, Endesa inaugurated its first gas station in the city of Lyon in France and this new station in Valdemoro has now joined the list. The company’s development plan includes the inauguration, during the first six months of the year, of other new gas stations in the cities of Zaragoza and Cadiz. “Endesa’s commitment to natural gas for fueling vehicles is based on the significant economic and environmental benefits of this fuel compared with traditional fuels,” the company added. Among the customers for the new LNG-CNG fuel station will be the bus fleets of the towns of Valdemoro, Pinto and Ciempozuelos. The main bus company in the area, AISA, currently has 200 vehicles and 10 percent of them will be natural gas vehicles before the end of the year. Natural gas is used in over 14 million vehicles worldwide, 1.3 million of which are currently located in Europe. In

Spain the NGV market is mainly urban bus fleets, municipal service fleets and long-distance road transport vehicles. “The use of natural gas in vehicles reduces nitrogen oxide (NOx) emissions by 70 percent and sulphur oxide (SOx) emissions by practically 100 percent,” it said. “Furthermore, it reduces 95 percent of particle emissions and the engines, which produce half the noise and vibrations and emit 20 percent less carbon-dioxide into the atmosphere,” Endesa added.

ENGIE of France, one of Europe’s leading importers of liquefied natural gas that most recently shipped an annual 16.4 million tonnes of cargoes, has renamed its trading arm Engie Global Markets for LNG and other markets. Engie, the former French utility GDF-Suez, had previously traded in energy and power markets under the name GDF-Suez Trading. The trading subsidiary serves all Engie’s business activities worldwide, including upstream and downstream energy markets. “With a 390-staff, Engie Global Markets has an extended geographical coverage in Europe and the Asia-Pacific region, with four trading floors in Paris, Brussels, Rome and Singapore, and activities spread across 40 countries,” Engie explained. “Under this new brand, we are reaffirming our ambition to further extend our client-base, product range and business activities at an international level,” said Philippe Vedrenne, recently appointed Chief Executive of Engie Global Markets. As far as its LNG market activities are concerned, Engie controls a fleet of 14 LNG carriers under mid-term and long-term charter agreements. The fleet is permanently optimized to satisfy Engie trading opportunities. One of Engie’s main LNG trading areas is Asia from its office in Singapore. The group has also a significant presence in regasification terminals in France and overseas, which gives a permanent access to markets. Engie will also be a trader in US LNG volumes by 2020 from its sales and purchase agreement with Houston-based export plant developers Cheniere Energy and its own stake in Sempra Energy’s Cameron LNG venture in Louisiana.

ENGIE, the French energy company, has signed a preliminary 10-year agreement to supply 400,000 tonnes per annum of liquefied natural gas cargoes to an import terminal planned for the Central American nation of Panama. The

binding memorandum of understanding was signed with Gas Natural Atlántico for its planned Costa Norte import facility to be located near the Panama Canal. US power company AES, which has an import terminal in the Dominican Republic, is developing the project with the two Panamanian companies to start commercial operations in 2018. The project involves an integrated LNG-to-power project at the Atlantic coast entrance to the Panama Canal. The project includes an LNG import terminal with 180,000 cubic metres storage capacity, which will supply natural gas to a 350 megawatts combined-cycle. “This new combined-cycle gas turbine facility will contribute to developing and securing Panama’s power demand by complementing the country’s hydro-power generation,” Engie said. Gerard Mestrallet, Chairman and Chief Executive of Engie, commented: “We are pleased to enter into this long-term relationship with AES in Panama, with the perspective of broader common developments in the region in the field of natural gas. “We consider natural gas as a key component, alongside the renewable energies, of the energy transition which is currently taking place on a global scale. It is Engie’s commitment to foster its expansion worldwide, in particular in the form of LNG as a flexible, clean and competitive energy supply.”

ENI, the Italian energy company, has successfully performed production tests on its new discovery in Egyptian waters of the East Mediterranean, saying the field has “a great production capacity. The Egyptian Zohr field will form the basis of the Arab nation’s planned natural gas hub. Eni said that during the tests, 120 metres of the Zohr field reservoir were opened to production in the Shorouk block offshore Egypt. “The well, constrained by surface facilities, delivered up to 44 million standard cubic feet per day (MMscfd) of gas,” Eni said. “The comprehensive set of data collected and analysed have proved that the well has a great production capacity, which is estimated in a deliverability of up to 250 MMScf/d in production configuration, or 46,000 barrels of oil equivalent per day,” the Italian company stated. “The programme envisages for 2016 the drilling of a further three wells. Besides, the onshore gas treatment plant construction works have already started and the bids for the offshore activities launched and nearly completed,” Eni

added. Eni holds 100 percent of the Shorouk licence and operations are being conducted by Petrobel, a joint venture between Eni and Egyptian state energy company Egyptian General Petroleum Corp. Italian energy company Eni was given the go-ahead in February 2016 by the Egyptian Ministry of Petroleum and Mineral Resources to develop the Zohr field, previously described as world-class. The Eni discovery will go some way to satisfying Egypt's domestic natural gas needs, while possibly helping to revitalize its two liquefied natural gas export plants. The Egyptians stopped producing LNG more than two years ago as natural gas supplies were diverted by the state energy companies to satisfy pipeline high demand in the domestic market. Even the existing gas resources were not sufficient and the Egyptians had begun importing LNG when the Eni discovery was made. Eni said the Zohr development plan envisages the start of production by the end of 2017, just two years after the discovery, with a progressive ramp up of output. Eni Chief Executive Claudio Descalzi has previously said he envisaged the offshore Zohr field underpinning a natural gas hub in the East Med. Some of the natural gas could eventually go to the Egyptian Damietta liquefaction plant of Union Fenosa Gas, which is a stakeholder company shared between Eni and Spain's Gas Natural. The second Egyptian liquefaction plant is at Ikdu near Alexandria. Egypt has also become an LNG importer with two Floating Storage and Regasification Units deployed at the port of Ain Sokhna in the Gulf of Suez. The Egyptians turned

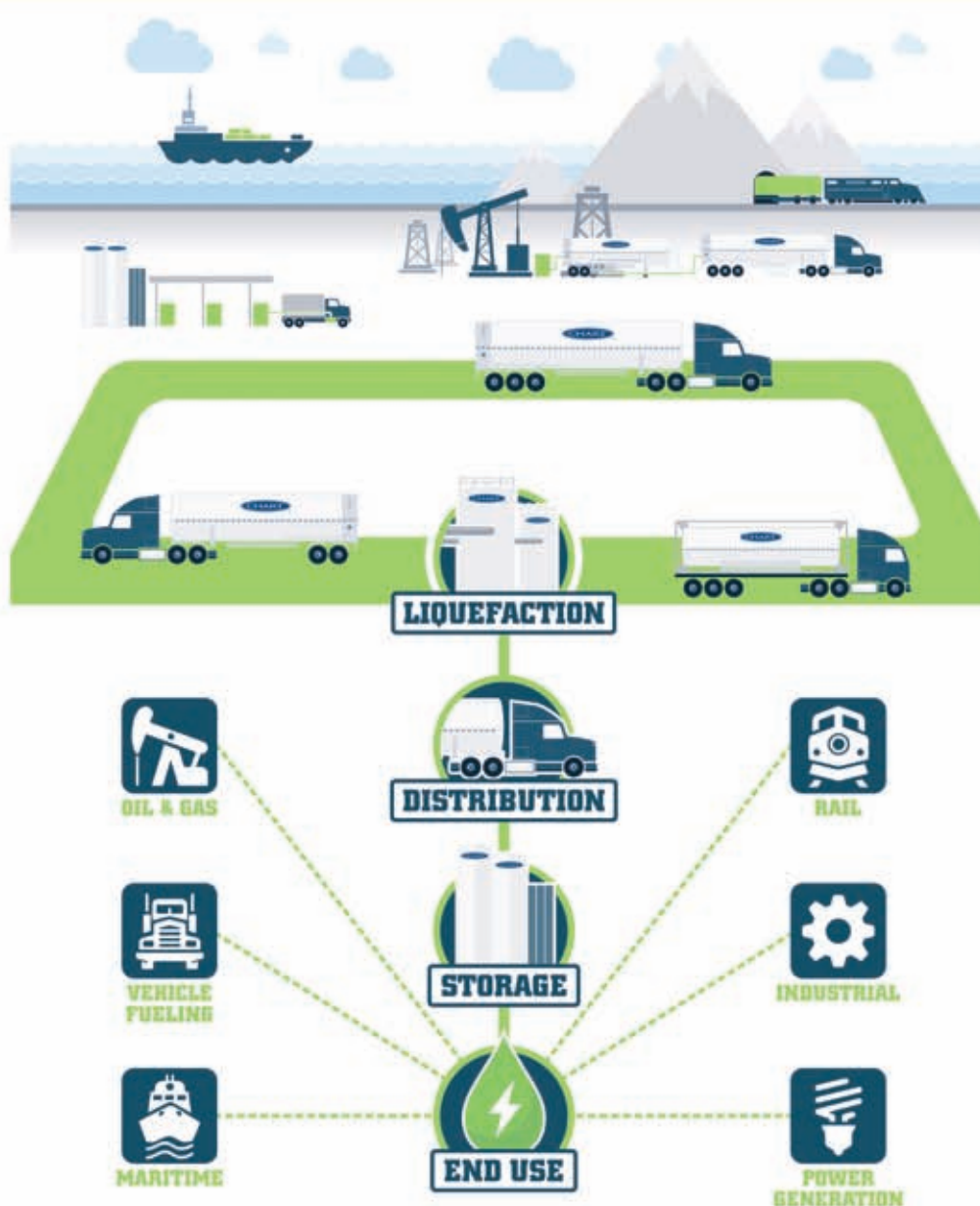
from exporters of LNG to importers in April 2015 to satisfy their natural gas consumption, which has increased by an annual average of 7 percent over the

previous 10 years. "The quick realization of such a large project will be possible through cooperation with Petroject, Enppi and Saipem contractors, who have always

contributed to the success of Eni's development activities in Egypt," the Italian company has said. The discovery of Zohr was announced in August 2015

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following the drilling of the Zohr-1 well in the block. According to the well and seismic information available, the discovery could hold potential resources of 30 trillion cubic feet and covers an area of about 100 square kilometres.

ENN Group of China, which has signed contracts for LNG cargoes from around the world, has agreed to purchase almost 12 percent of the shares of Australia energy company Santos, a stakeholder in three Asia-Pacific liquefaction plants. The ENN shareholding of 11.7 percent of Santos will come from a private share placement made in 2015 by Santos itself to equity fund Hony Capital of China. The Santos stake cost US\$750 million to make ENN the largest individual shareholder in the Australian company. At the same time, Chinese equity fund Hony is taking a “strategic” stake in the ENN Group. Santos also placed shares in 2015 with another of Asia's leading equity funds, Singapore state fund Temasek, as part of a capital-raising exercise to weather the storm of the oil price plunge. Santos, whose Gladstone coal-seam-gas-to-LNG plant was recently completed on Curtis Island in Queensland at a cost of US\$18.5 billion, is also a stakeholder in the Darwin LNG facility run by ConocoPhillips and the Papua New Guinea liquefaction plant operated by ExxonMobil. The privately-held Chinese group and its ENN LNG and energy subsidiaries own and operate natural gas supply businesses in 152 cities across 17 provinces and autonomous regions of China. The company is also having its own LNG import terminal built at Zhoushan in China's eastern Zhejiang province. In addition to taking the Santos stake, ENN has also signed preliminary supply agreements with two other Australian LNG plants, Chevron's Gorgon LNG and the Australia Pacific LNG facility in Queensland, operated by ConocoPhillips. “The proposed acquisition is an exciting move for ENN,” said Wang Yusuo, Chairman of the ENN Group. “This introduction to the upstream sector takes us a step forward in our aim to generate value across the entire natural gas value chain, and allows us to learn and build experience,” Wang added. “Equally importantly, we are gaining a strategic investor and partner in Hony Capital whose deep China experience and global outlook can help us accelerate future growth overseas,” he stated. The growth of the group's natural gas sales has established it as the largest private

natural gas company in China. It sold 11.3 billion cubic metres of natural gas in 2015, the equivalent of 8.4 million tonnes of LNG. ENN also operates a network of 576 LNG and compressed natural gas (CNG) refueling stations across China. Santos said in a statement on the proposed acquisition of Hony's shareholding to the ENN Group that it had given its consent to the transaction. Among ENN's LNG supply contracts, one is also with Australia's Origin Energy, a shareholder in the Australia Pacific LNG plant operated by ConocoPhillips and with China's Sinopec also as a stakeholder. Origin recently signed a preliminary agreement with ENN LNG Trading for the supply of 500,000 tonnes per annum for five years from APLNG with options for a longer term. Shipments are expected to start sometime in 2018 when ENN's Zhoushan terminal is completed. France's Total has also signed a deal to supply 500,000 tonnes per year to ENN from 2018 on completion of the Zhoushan facility.

EXCELERATE Energy, the US floating LNG project company, said its vessel “Explorer” deployed in the United Arab Emirates has been upgraded to reach a landmark send-out capacity of 1.0 billion cubic feet per day at Jebel Ali port in Dubai and can also supply bunkering services. The Floating Storage and Regasification Unit is chartered under a long-term agreement to the Dubai Supply Authority. “We approach each of our projects as partnerships and work closely with our customers, like DUSUP, to provide a tailored solution that will serve their specific needs for the long run,” said Rob Bryngelson, President and Chief Executive of Excelerate. “We are committed to investing in the advancement of our technology to achieve this,” Bryngelson added. The UAE entered into a long-term charter agreement with Excelerate in 2014 for a larger and more efficient FSRU to replace its existing regasification vessel. Under the agreement, Excelerate upgraded the “Explorer” and customized the FSRU to meet DUSUP's supply requirements. The “Explorer” entered dry-dock for its efficiency upgrades in October 2015 with the modifications being completed in December 2015. Excelerate said it had enhanced the vessel with advanced features, including new high-pressure vaporizers and pumps installed to increase regasification send-out capacity from 690 MMcf/d to 1 Bcf/d. “The increase in regasification capacity will

allow DUSUP to import more LNG cargoes during the year providing greater flexibility for market conditions,” said the Houston-based company. A dual-fuel diesel generator power module was also added to the FSRU. The module provides more fuel-efficient power generation for regas services. Another significant upgrade to the vessel was the addition of the world's first LNG bunker port installed in an FSRU. The bunker port enables small-scale LNG off-takers to re-fuel with LNG directly from the “Explorer”. This added versatility allows Excelerate to facilitate DUSUP in providing small-scale LNG supply services to the local area, the US company said.

EXMAR, the Belgian LNG shipping and project development company has signed a settlement agreement with Pacific Exploration and Production, the successor company to the Pacific Rubiales and its Caribbean Floating LNG project in the South American country of Colombia. The Exmar group controlled by Nicolas Saverys ordered the FLNG vessel under a contract with Pacific Rubiales. The LNG production venture on the Caribbean coast of Colombia had originally been set to become the world's first FLNG production plant. It was to process feed-gas delivered by pipeline from onshore to a hull berthed at a jetty. The gas would have come from the onshore Creciente natural gas field. Exmar and the CFLNG venture had signed a 15-year charter agreement in 2012 for the FLNG hull with capacity to produce 500,000 tonnes per annum and with storage of 16,100 cubic metres. “Since the execution of the agreement the domestic natural gas market in Colombia and international LNG market have changed substantially making the liquefaction of LNG in Colombia no longer economic,” Exmar said. The marketing and trading arm of Russia's Gazprom in 2013 even signed a contract with Pacific Rubiales for 500,000 tonnes per annum of cargoes from Caribbean FLNG production for five years. Exmar is still expecting delivery of the Caribbean FLNG hull from its Chinese shipyard in the port of Nantong, owned by Wison Offshore & Marine, in the second quarter of 2016 and is seeking another customer. “By virtue of the settlement agreement, any and all obligations in connection with the Tolling Agreement have been terminated. CFLNG is available for other projects around the world and Exmar is actively negotiating new employment of the

CFLNG with several counterparts,” said the Antwerp-based company.

FLOGAS BRITAIN, the UK's leading liquefied natural gas distributor via trucks, has completed a multi-million pound investment in its LNG distribution fleet as it continues to expand. The investment by Flogas, based near the UK Midlands city of Leicester, is in trucks made by German company Gocher Fahrzeugbau (GOFA), a firm owned by US LNG equipment maker Chart Industries. Companies such as Flogas supply the LNG retail market for fuel or deliver to commercial and industrial users, some of whom may not be connected by natural gas pipelines. “With nine LNG tankers on the road, more than any of our competitors, the investment offers customers unparalleled flexibility, reliability and delivery security,” Flogas said. “The new fleet brings much greater efficiencies in terms of deliveries,” said Rob McCord, Flogas Head of LNG. “It enables us to create hubs, and spread our trucks across the country so we are better placed to meet our customers' needs, especially during traditionally challenging periods,” McCord added. Flogas said it can now cover the whole of the UK with its fully trained specialist drivers, large support, technical, logistics and sales team as well as dedicated fleet scheduling. The UK company was the first trucking firm to fill up at the Isle of Grain LNG import in Kent when it began truck-loading operations in November 2015. Grain LNG, owned by National Grid, imports cargoes from nations such as Qatar, Algeria and Trinidad. Terminal-sourced retail LNG sales activity has been increasing across Europe since 2013 and there are truck-loading operations at other import facilities, including Montoir-de-Bretagne and Fos-Tonkin in France, Zeebrugge in Belgium and Rotterdam's Gate terminal in the Netherlands. “These are exciting times for Flogas and our customers,” said McCord. “We've created a specialist LNG team, have the largest fleet and the most comprehensive LNG infrastructure in the country. “On top of this, we've been rewarded by the largest LNG terminal in Europe,” he said, referring to the Grain LNG facility with its 1 million cubic metres of storage capacity.

FLUOR CORP., the Texas-based energy and LNG engineering and construction company, has completed its acquisition of Stork Holding BV of the Netherlands for more than \$700 million

as industry consolidation continues to lower costs in a weaker commodity market. Stork, whose headquarters are in Utrecht, is a global provider of maintenance and asset integrity services in oil and gas and related industries. Fluor agreed to purchase the company in December 2015 from UK-based private equity firm Arle Capital Partners. "I welcome our 15,000 new colleagues from Stork and we are excited to have them join the Fluor family," said David Seaton, Chairman and Chief Executive of Fluor. "Fluor's most important asset is its people, and we are fortunate to have found in Stork a company that shares the same values, pride and global heritage as we do," Seaton stated. Founded in 1827, Stork has long-term relationships with a diverse range of customers and has operation in continental Europe, the UK, the Middle East, Asia-Pacific and the Americas. "Stork's business model is primarily based on ongoing operating budgets that are less impacted by capital spending plans and volatile commodity prices," Fluor said. "The addition of Stork's capabilities to the Fluor portfolio will help meet customers' needs throughout the full lifecycle of an operating plant," the US company added. Stork, along with Fluor's current Operations & Maintenance division, will be led by current CEO Arnold Steenbakker and report financially under the Global Services business segment of Fluor.

GASLOG LTD., the Monaco-based and Greek-controlled liquefied natural gas fleet owner with 10 ships in operation and eight on order, is planning a major strategy change and has appointed a new head of floating LNG ventures. The company has appointed a

new executive to develop its Floating Storage and Regasification Unit business to give countries fast-track import facilities. GasLog named Bruno Larsen as

Head of FSRU Development, saying he "has extensive experience in the LNG and FSRU sectors and will be responsible for leading GasLog's commercial activities." It

was also currently evaluating a number of FSRU opportunities as well as undertaking a front-end engineering and design study at the Keppel shipyard in



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Singapore. The GasLog study is focused on the potential conversion of GasLog's and GasLog Partners LP's existing steam and tri-fuel diesel electric LNG carriers into FSRU vessels. The moves come as GasLog is forced to consider alternative key strategies after its main charter customer, BG Group of the UK, was taken over by Royal Dutch Shell. The company said Larsen had 30 years of international experience in the global oil and gas industry, especially within the LNG sector, including LNG production, LNG shipping, floating production storage and offloading vessels, floating offshore import terminals and new technology. Prior to joining GasLog, Larsen held a number of senior LNG roles at Australian engineering company WorleyParsons, Singapore's BW Offshore, Norway's shipping and FSRU firm Hoegh LNG and French energy major Total. "I am delighted to join GasLog, one of the leading LNG transportation companies in the world," said Larsen. "GasLog has the technical expertise and the platform to become a leading player in the FSRU market and I am excited around the future opportunities for the company," the executive added. Paul Wogan, Chief Executive of GasLog said he was delighted to welcome Larsen to GasLog to lead FSRU development. "He brings a wealth of experience and joins us at an exciting time in the development of the FSRU market," said Wogan. "Given the significant volumes of new LNG production due to come online over the next few years, we expect FSRU's will play an increasingly important role in creating new markets for LNG," the CEO stated.

GASUNIE of the Netherlands, the natural gas transmission company and joint owner of the Gate LNG import terminal in Rotterdam, has posted solid financial returns and said Europe was becoming increasingly popular as a market for LNG from all over the world. As expected, Gasunie's annual revenue declined slightly to 1.63 billion euros (\$1.84Bln) compared with 1.65Bln euros the previous year. Net profit in 2015 amounted to 553 million euros, down from 603M euros in 2014. The Dutch state as a main shareholder will receive a dividend of 332M euros from the net profit. "The Gate terminal is evolving into a European LNG hub, contributing to the security of supply in north-west Europe," Gasunie said in its earnings statement. The best performance was in the number of loaded trucks and containers rising sharply

during the past year to 788 from 174 in 2014. Gasunie pointed out that at the end of March 2015, the construction of a second loading platform for small-scale LNG started. "This installation is scheduled to be completed and ready to supply services in mid-2016," the company said. "For the fourth year in a row, the throughput of LNG increased. In 2015, the number of unloaded ships increased to 21 versus 14 in 2014. In addition, the number of loadings of large tankers and small-scale tankers increased from 20 in 2014 to 28 in 2015. Gasunie said operating costs rose by around 87M euros and the rise was largely due to higher operating costs. "For example, Gasunie added to the provision for shutting down and removing parts of pipelines to make the infrastructure in Groningen more earthquake-proof," it explained. "In addition, the maintenance costs relating to the multi-year maintenance and replacement programme of Gasunie Transport Services (GTS) were higher, as were the construction costs incurred in removing the old Elbe culvert in Germany," Gasunie said. The total volume of gas transported through the Gasunie network in 2015 fell to 1,179 tera-watt hours (TWh) from 1,233 TWh in 2014. Gasunie said the Dutch natural gas trading platform, the Title Transfer Facility (TTF), once more showed strong growth. The traded volume increased by 25 percent to a volume of 16,684 TWh compared with 13,216 TWh in 2014. As a result, the volumes traded on TTF, which is the largest gas trading platform in continental Europe, are approaching those of the British National Balancing Point (NBP), which in 2014 was still twice as large as the TTF. "The volume traded via TTF was larger than the domestic consumption. The increase on TTF has been caused by increases in both the bilateral Over-The-Counter trade (OTC) and trading via gas exchanges," Gasunie explained.

GAZTRANSPORT and Technigaz (GTT), the French designer of membrane containment systems for LNG maritime transportation and storage, said its training unit received its first order for simulator technology for cargo handling. GTT Training will supply its G-Sim LNG simulator software to US tech firm L-3 DPA Inc., based in Alexandria, Virginia, and Chevron Corp. "The contract involves the development of a new LNG carrier model based specifically on the new LNG vessels owned and operated by Chevron.

"The G-Sim software will also interface with the Engine Room simulation equipment being provided for Chevron by L-3 DPA," GTT said. "G-Sim provides full simulation of all the systems on a vessel that are involved in the management and handling of the LNG cargo and maintaining the vessel in a safe condition," GTT said. In addition to the Chevron-specific vessels, the instructors will also be able to select from 16 different configurations of LNG carrier, with the selection being based on tank capacity, containment system and propulsion system, to cater for future requirements. Developed internally by GTT Training, G-Sim provides an effective training platform for operatives in the handling of LNG cargoes. "We are very honoured to receive this contract from one of the leading simulation companies in the world, L-3 DPA, and one of the leading LNG operators, Chevron," said Ray Gillett, Director and General Manager of GTT Training. "It is a reflection of our commitment to work directly with the industry to provide the training resources required to ensure high skilled personnel will continue to be available to meet the industries requirements," Gillett added. The GTT parent company recently reported 117 million euros (\$130M) in net income for last year, a rise of 1.61 percent. Revenues from operating activities were little changed at 226M euros. The company reported 35 new orders in 2015 for its technology for maritime containment storage tanks. As sector leader in LNG storage, GTT is able to sell licensing agreements around the world for up to \$10M per licence to install its membrane technology in vessels. It is currently launching its latest tank, the No. 96 Max, an optimized version of the No. 96 system used in more than 120 LNG carriers to date.

JAPANESE LNG imports of long-term contract and other cargoes dropped last month and the average price was at \$8.23 per million British thermal units, a more than 43 percent plunge on a year-on-year basis. Japan's imports in February amounted to 7.43 million tonnes compared with 7.73MT in February last year, a fall of 3.8 percent. The February deliveries also cost 43.5 percent less than a year ago at 355 billion yen (\$3.17Bln) compared with 628Bln yen (\$5.62Bln) in February 2015. This means the average price paid by Japan in February 2016 for cargoes was \$426 per tonne, or \$8.23 per MMBtu, compared with \$727 per tonne, or

\$14.06 per MMBtu, in the year-ago period. The total cost of LNG shipments for the whole of 2015 in dollar terms amounted to \$46.6Bln compared with \$66.1Bln in 2014. Imports of LNG from the Middle East plunged during last month. Shipments from countries like Qatar, the United Arab Emirates and Oman fell to 2.04MT in February, a drop of 14.3 percent compared with the same month last year. Asian deliveries from nations such as Malaysia and Indonesia, Papua New Guinea and Brunei amounted to 2.54MT, a rise of 28.2 percent. Russian imports by Japan plunged by 54.3 percent to 364,000 tonnes from the Sakhalin Island plant because of outages. Imports from other nations such as Nigeria and other producers, as well as re-exported and spot trading cargoes, accounted for the balance of 2.49MT. In separate figures given by Japan on March 9, the price of spot LNG cargoes imported into the country amounted to \$6.90 per MMBtu compared with \$10.70 per MMBtu in the year-ago period as the worst effects of the oil slump began to level off in the LNG market. The latest delivered prices showed a \$3.80 per MMBtu drop compared with spot shipments received in February in 2015. The levelling off was clearer in the average price of cargoes contracted in February and to be delivered later. These were at \$6.50 per MMBtu in February 2016 compared with \$7.60 per MMBtu in February 2015, a fall of just \$1.10 per MMBtu. The March 2016 spot LNG numbers are expected to be close to or even higher than the March 2015 price of \$7.60 per MMBtu for delivered cargoes. Analysts said any downward price differentials of \$1 per MMBtu or more can only be expected for the year-on-year comparisons for the rest of 2016 in the unlikely event that LNG carriers are provided free of charge. The LNG spot statistics are published by Japan's Ministry of the Economy, Trade and Industry and come from the nation's utilities, the main users of the fuel. Trading companies are excluded from the statistics. Japanese LNG spot prices and those in Asia in general have slumped along with oil since hitting \$20 per million British thermal units in February 2014. The Tokyo government published spot prices for the first time for delivered and free-on-board (FOB) cargoes in March 2014 when there was growing concern from the world's largest LNG user that it was paying too much for its cargoes on a spot basis. The next set of spot prices is published in Tokyo on April 11, 2016.

JORDAN COVE, the LNG project in the northwest state of Oregon recently blocked by US regulators, is set to get back on track after it signed a supply agreement with the two largest utilities in Japan. Jordan Cove project developer, Canadian company Veresen Inc., revealed on March 11, 2016, it had received its rejection notice from the US Federal Energy Regulatory Commission that cited the Pacific Connector Gas Pipeline as the main obstacle to moving forward, as well as the fact it had not signed a supply agreement. The venture is planned for the Coos Bay area of in Oregon with a budget of \$6 billion. It completed its environmental impact regulatory process with the FERC on September 30, 2015. Veresen said it had now signed commercial terms for a 20-year supply agreement with JERA Co. Inc., a joint venture between Tokyo Electric Power and Chubu Electric. This will give the Japanese utilities natural gas liquefaction capacity in the form of a tolling agreement at the Jordan Cove LNG facility planned for Coos Bay in Oregon. The preliminary agreement signed today covers the purchase by JERA of at least 1.5 million tonnes per annum of LNG tolling. "This agreement is subject to customary conditions including the execution of a detailed liquefaction tolling agreement which Veresen and JERA will continue to work together to conclude, and the project obtaining applicable regulatory approvals," Veresen added. The Canadian company said it was continuing to negotiate additional supply agreements with other parties as well. The JERA joint venture was established on April 30, 2015, by Tepco and Chubu as a way of bringing down costs covering the entire energy supply chain, from upstream investments and fuel procurement through to power generation. The Tepco-Chubu combination is the biggest LNG buyer in the world, purchasing almost half of Japan's annual requirement of around 88 million tonnes. The joint venture became possible under Japanese government reforms to liberalize the power sector in the country. "This agreement signals strong market support for the Jordan Cove LNG project from the world's largest LNG buyer and represents a significant step forward in the project's development," said Don Althoff, President and Chief Executive of Veresen. "We are pleased to have JERA as our first customer and look forward to deepening our relationship with them as we

continue to progress Jordan Cove LNG," Althoff said. The Jordan Cove LNG facility is expected to have an initial design liquefaction capacity of about 6.0 MTPA, or 1 billion cubic feet of natural gas per day. The venture had been expecting to have its FERC "Notice to Proceed" in mid-2016, leading to a final investment decision thereafter. Instead it was informed by the FERC it could not go forward. The FERC said it was blocking Jordan Cove, firstly because the affiliated pipeline "would bring adverse impacts to landowners and communities. Clearly, we are extremely surprised and disappointed by the FERC decision," Althoff said at the time. "The FERC appears to be concerned that we have not yet demonstrated sufficient commercial support for the projects," Althoff explained. The CEO said the Jordan Cove project and Pacific Connector pipeline venture were now the subjects of FERC rehearing requests. Regulators said in their rejection order that "authorization for commencement of construction would not be granted until the Pacific Connector has successfully executed contracts for a certain level of service." The order also said it would not issue a certificate to allow the project to proceed "in what we find to be the absence of a demonstrated need for the pipeline." A second export project in the US Northwest is Oregon LNG and it is also being held up. The venture was informed in February 2016 that the FERC had delayed by five months its releasing of the final environmental impact statement. Oregon LNG is an export-import plant planned at Warrenton on the Skipanon Peninsula, near the mouth of the Columbia River. It will now have its EIS issued in early June 2016 instead of February 12. The Oregon venture is owned by Leucadia National Corp., a US diversified holding company engaged through its subsidiaries in a variety of businesses, including investment banking, manufacturing and energy. The new schedule also affects two related pipeline projects, the Oregon Pipeline Co.'s terminal inter-connection and Northwest Pipeline's Washington Expansion Project. While the US Sabine Pass plant in Louisiana has now exported its first cargo slightly behind schedule, the industry in North America is still facing regulatory headwinds.

KBR, the US energy and liquefied natural gas engineering firm, was awarded a multi-phased contract for front-end engineering and design for the

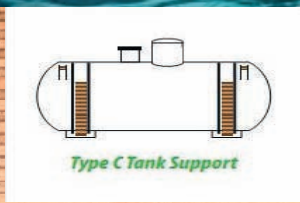
Canadian LNG export project controlled by Indonesian billionaire Sukanto Tanoto and his Pacific Oil and Gas company in the province of British Columbia. The Woodfibre LNG project has just received environmental approval from the federal ministry in Ottawa for the liquefaction plant and export terminal planned near the town of Squamish, north of Vancouver. Under the terms of the contract, KBR's Houston office will provide FEED services for the proposed liquefaction plant and export facility to produce 2.1 million tonnes per annum of LNG. The work will include engineering optimization and the development of a fixed-price offer for engineering, procurement and construction services. "KBR is a world leader in LNG engineering and design," said Byng Giraud, the Canadian manager of Woodfibre LNG. "The award of the FEED contract to KBR ensures the Woodfibre LNG project is engineered and designed to world-class standards, and marks another important step towards making the project a reality," Giraud added. Roy Oelking, President of KBR's Engineering & Construction (E&C) business, said his company had a strong track record for developing projects in

British Columbia. "We are pleased to play an important role in the Woodfibre LNG project, providing the expertise and capability of our 40-year history in LNG project delivery to help make this project a success," Oelking stated. KBR did not disclose how much the contract was worth. "The contract is multi-phased and the first phase will be booked into backlog of unfilled orders for KBR's E&C business segment the first quarter of 2016," KBR said. The LNG unit of Tanoto's company, which has corporate offices in Singapore, Beijing, Hong Kong and Jakarta, has already signed a supply contract with China's Guangzhou Gas and owns a stake in a Chinese LNG import terminal. Woodfibre is proposed for construction on traditional lands claimed by the Squamish First Nation of native North Americans. The First Nation, which numbers around 4,000 members, is set to give the venture overall approval after setting some of its own environmental review conditions. The Asian-led development has already received environmental approval from two provincial ministries. Pacific Oil and Gas also holds a 35 percent share in China's Rudong LNG receiving terminal in










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Jiangsu, the coastal province north of Shanghai, with 55 percent held by Kunlun Energy, a Hong Kong listed subsidiary of PetroChina. The remaining 10 percent share is held by Jiangsu Guoxin, the investment company of Jiangsu province. Analysts said the approval from Ottawa is a major point of progression, given the expected difficulty of advancing hydrocarbon energy projects under new Prime Minister Justin Trudeau. However, Trudeau's Minister of Environment and Climate Change, Catherine McKenna, has ruled that Woodfibre LNG was "not likely to cause significant adverse environmental effects." In her Environmental Assessment Decision statement, the minister established legally binding conditions, which include mitigation measures and follow-up requirements relating to protection of fish stocks with which Woodfibre must comply throughout the life of the project. McKenna imposed numerous conditions on the project, including restrictions related to construction in or near fish habitat.

KINDER MORGAN is seeing regulatory progress in its plans to move feed-gas from the Marcellus Shale in the US northeast to the Gulf Coast to boost supplies for LNG export projects in Louisiana and Texas. The US Federal Energy Regulatory Commission has given conditional clearance to a pipeline that will be one of the key feed-gas suppliers to make LNG to be exported to Japan. The FERC has just ruled that the expansion of Kinder's Tennessee Gas Pipeline could be achieved without undue harm to the environment if mitigation measures are carried out. The \$400 million project would increase the capacity of TGP's pipeline system by adding more compression and associated facilities, allowing TGP to provide long-term firm transportation services to LNG project shipper Antero

Resources Corp. Antero in October 2015 signed a 10-year agreement with the US unit of Japanese utility Chubu Electric Power to provide feed-gas for processing and export from the Freeport liquefaction plant in Texas. Antero, based in Denver, said it would sell feed-gas to Chubu US Gas Trading through the Freeport LNG plant. The independent US exploration and production company will begin shipping volumes once the liquefaction plant is placed into commercial service, which is expected to be by the end of 2018 or the beginning of 2019. Antero said it would be able to move up to 1.1 billion cubic feet per day on a firm basis to "favorably priced markets" on the Gulf Coast once the TGP pipeline expansion is in place. Other pipeline projects are also being developed to increase shale-gas supplies for LNG plants in the south from states such as Pennsylvania and West Virginia. Freeport LNG has previously signed a 20-year use-or-pay liquefaction tolling agreement with Chubu and another Japanese utility Osaka Gas, the equivalent to the minimum guaranteed production capacity of its first Train. The two Japanese companies also agreed in 2014 to invest about \$1.2 billion of funding for the Freeport export facility located on Quintana Island. The facility is an existing import terminal being transformed into an export plant. Antero is a player in the main US shale plays. It was recently operating five drilling rigs and two completion crews in the Marcellus Shale. The Kinder pipeline and Antero have an agreement whereby the exploration and production company was awarded 100 percent of the capacity offered on two TGP expansions. Antero has been subscribing to transportation capacity for "natural gas produced in the Utica and Marcellus Shale supply areas for markets in the southeast United States." TGP has proposed building four new greenfield compressor stations (two in West Virginia and one each in

Kentucky and Tennessee), and modifying two existing compressor stations along its system in Kentucky. In its original application, TGP had requested FERC approval by January 31, 2016, to meet a planned in-service date of November 2017. The FERC said it was accepting comments on the TGP environmental assessment until April 11.

KOSMOS ENERGY, a US exploration and development company based in Dallas, Texas, said it was planning a world-class liquefied natural gas project offshore West Africa after its latest natural gas find in the waters of Senegal and Mauritania. Kosmos Energy, a company listed on the New York Stock Exchange and with operations centred on Africa, said its Ahmeyim-2 appraisal well offshore Mauritania had "encountered 78 metres of net gas pay in two excellent quality reservoirs". "Ahmeyim-2 is our fourth successful exploration and appraisal well and continues our 100 percent success rate in the outboard cretaceous petroleum system offshore Mauritania and Senegal," said Kosmos Chairman and Chief Executive Andrew G. Inglis. "With this well, we believe we have proven sufficient gas resource to underpin a world-scale LNG project in the Tortue West structure alone," Inglis stated. "The combination of the resource size and quality continue to support our view that Tortue is a competitive source of LNG and we are working towards commercialization," Inglis added. West Africa, where Nigeria has become the world's fifth-largest LNG exporter after starting its first processing Train on Bonny Island in the Niger Delta in 1990, is experiencing a surge in the development of LNG projects, even amid the energy downturn. A floating LNG export project is already being pursued by Ophir Energy of the UK in the waters of neighbouring Equatorial Guinea, a nation which already has an onshore production plant on Bioko Island. This has been in operation since 2007. Another FLNG export venture is being developed in neighbouring Cameroon by European energy company Perenco, Golar LNG of Norway and the African nation's state energy company Societe Nationale des Hydrocarbures. The Cameroon project is aiming for first cargoes by the second half of 2017 from feed-gas in the Sanaga Sud and Ebome gas fields. Both the Cameroon and Equatorial Guinea FLNG projects will use converted LNG carriers being transformed into floating liquefaction and storage hulls at the Keppel Shipyard in

Singapore. The LNG plans for Senegal and Mauritania by Kosmos is a success based on its strategy of exploration focused on frontier and emerging areas along the Atlantic Margin. Its current assets include existing production and development projects offshore Ghana, other large discoveries offshore Mauritania and Senegal, as well as exploration licenses with significant potential offshore Portugal, Sao Tome and Principe, Suriname, Morocco and the Western Sahara. "Our well-to-seismic calibration has again been proven, highlighting the reliability of this tool and increasing our confidence in its use for fully unlocking the basin, which we believe has significant potential for both oil and gas," Kosmos said of its latest discovery. "We now plan to drill the first of three independent oil tests in our blocks offshore Mauritania and Senegal, starting with the Teranga-1 well, located in the Cayar Offshore Profond Block, offshore Senegal," the company added. Since 2012, Kosmos has held rights to conduct exploration in the C-8, C-12, and C-13 contract areas under production sharing contracts with the Government of Mauritania's national energy company SMHPM. Kosmos operates the Ahmeyim-2 well with 90 percent equity and SMHPM holds 10 percent. The Mauritanian blocks are in water depths between 1,000 and 3,000 metres and have combined acreage of around 27,000 square.

KUWAIT has awarded a South Korean consortium led by Hyundai Engineering and Construction Co. a contract to build the Gulf nation's new onshore liquefied natural gas import terminal at Al-Zour to supplement supplies received at the port-side Regasification and Storage Unit at Mina Al-Ahmadi. Under the contract with Kuwait National Petroleum Co., Hyundai and state-run Korea Gas Corp. will construct and fit out the regasification facilities and LNG storage tanks close to a new refinery complex, about 90 kilometres south of the capital, Kuwait City. The Korean consortium said the LNG import project was scheduled to be completed in 2020. "The project's purpose is to provide long-term facilities for receiving supplies of LNG to supply feed to the power generation plants in the country during period of peak electricity demand," said KNPC. "The Al-Zour area was selected as the most appropriate site for the LNG receiving, regasification and storage tanks," it added. The state-owned energy company is building the facility with the guidance of Korea's Kogas, the largest

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Flame - Europe's Leading Natural Gas & LNG Conference
 May 9-12, 2016
 Hotel Okura - Amsterdam
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www.icbi-flame.com

June
The 11th Annual Conference FLNG 2016
 June 6 - 9, 2016
 Hyatt Regency - The Churchill
 London, UK
www.icbi-events.com

14th World LNG Series: Americas Summit & Exhibition
 June 7-10, 2016
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corporate importer of LNG. Kogas operates four terminals in Korea at Samcheok, Tong-Yeong, Incheon and Pyeongtaek. The Kuwaiti terminal will have four storage tanks, each of 180,000 cubic metres capacity. Foster Wheeler, the LNG engineering company now part of the UK's Amec construction group, completed the initial conceptual and detailed feasibility studies for the terminal to assist in the selection of the most suitable technology. The terminal, tanks and additional infrastructure would cost 1 billion Kuwaiti dinar (\$3.3Bln), KNPC said. Kuwait began importing LNG in 2009 through an FSRU deployed on a quayside at Mina Al-Ahmadi port. KNPC has three years left on a five-year contract with Royal Dutch Shell and BP to receive LNG cargoes on a seasonal basis at the Mina al-Ahmadi terminal. The onshore LNG terminal will be sited next to one of the world's largest refinery projects being developed at Al-Zour. The project includes an oil refinery with a total capacity of 615,000 barrels per day. The refinery has a strategic goal of supplying low-sulfur fuel with less than 1 percent content compared with the current 4 percent sulfur content. "The LNG terminal and Al-Zour Refinery will fulfil the downstream strategy of Kuwait Petroleum Corp." it added.

LINDE of Germany has signed an agreement with a US-based liquefied natural gas equipment maker in Pennsylvania, the subsidiary of a Japanese company, to cooperate on small-scale and medium-sized liquefied natural gas production ventures. Linde and the Jeannette, Pennsylvania-based Elliott Group plan to develop a "highly standardized and modularized" concept for the main refrigerant cycle compression section of Linde's generic liquefaction plants called "Star LNG". Elliott is a wholly owned unit of Ebara Corp., a major industrial conglomerate headquartered in Tokyo. Ebara employs 15,000 people and has annual sales of \$5 billion. The Linde LNG concept ranges between 200,000 tonnes per annum of capacity to 1.3 million tonnes per annum. "The agreement enables Linde Engineering to significantly increase the speed to the market," the German company said. Linde's Star LNG was developed to standardized and optimize LNG plant processing variations and among other benefits offers a fast-track engineering, procurement construction schedule. The German plant equipment also offers competitive capital costs and uses Limum LNG processing.

The generic Linde plant concept offers 200 tonnes per day of net liquefaction capacity and supports other ranges up to 3,000 tonnes per day, using the same pre-engineered plant design. For liquefaction of feed-gas, two proprietary designs are offered for heat exchanger equipment, which generally lies at the heart of most natural gas processing steps. Linde offers both coil-wound and plate-fin heat exchangers, depending on plant capacity and operational requirements. "With this initiative we have further enhanced the degree of standardization of our Star LNG family which allows us to combine best-in-class quality with competitive pricing and attractive delivery times," said Marcus Lang, Executive Vice President of LNG and Natural Gas Processing at the Linde Group's Engineering Division. John Rann, Vice President of Engineered Products at Elliott, expressed the company's enthusiasm for signing the accord with Linde. "We are delighted to support the Linde Group in their endeavors to further increase competitiveness with Elliott's line of highly efficient, technically advanced centrifugal compressors, and our wealth of experience in refrigeration applications," said Rann. Elliott is one of the pioneers in LNG refrigeration compression dating from the initial commercial market in 1964. "Our LNG compression solutions include boil off gas, mixed refrigerant, dual refrigerant, end flash gas, propane refrigeration and boosters," Elliot said. Over the years, Elliott said it had contributed to industry-leading innovations in LNG services, including the world's first base-load LNG refrigeration compressors and the first gas turbine-driven compressors at an LNG plant.

LNG Ltd., the Australian company, has extended its lease for the Fisherman's Landing LNG project site located in Gladstone in the state of Queensland where three other coal-seam-gas-to-LNG projects have been built. The company, a developer of LNG ventures in North America, said it prolonged its FLLNG site agreement for the land lease with the Gladstone Ports Corporation to the end of March 2017. "An option to further extend on the same terms through to March 2018 has been secured, subject to the provision of appropriate evidence demonstrating to GPC that the FLLNG project remains a positive investment intention," LNG Ltd said. The Fisherman's Landing lease was originally signed in May 2010 and the company also holds Queensland state licences for project construction as well as

a pipeline licence. The Fisherman's Landing site is closed to the three existing CSG-to-LNG plants operated by ConocoPhillips, Australia's Santos and Queensland Gas Co., a subsidiary of Royal Dutch Shell. In addition to its, Fisherman's Landing lease LNG Ltd is also slowly advancing with the US Magnolia LNG export project in Louisiana and the Bear Head venture in Nova Scotia, Canada. "The extension helps us progress towards recommencing the development of the FLLNG project," said LNG's Managing Director and Chief Executive Maurice Brand. "LNG continues to investigate opportunities for gas supply to the FLLNG project and discussions with potential LNG buyers supplying the Asian market are ongoing," Brand added. "No significant capital commitment to the FLLNG project will occur until binding agreements are materially advanced. The costs associated with this extension and support services falls within the company's existing three year cash management plan," said Brand.

NIPPON Kaiji Kyokai, the Japanese marine classification society, which has almost 60 liquefied natural gas carriers on its books, has named Koichi Fujiwara as its new Chairman and President. The society, known as ClassNK, said Fujiwara was promoted to the post from executive vice president after incumbent Chairman and President Noboru Ueda stepped down. Two other current executive vice presidents, Yasushi Nakamura and Tetsuya Kinoshita, would continue in their present roles and be joined by Junichiro Iida as Managing Director. "Following the recent downturn of the shipping and shipbuilding markets, the business environment surrounding ClassNK has become even more challenging," said Fujiwara on his appointment. "Under our new executive team, we will work to ensure stable operations and further enhance our corporate governance as required of an independent third-party organization so that the society can continue contributing to the development of the maritime industry in the long term," Fujiwara stated. The new ClassNK chief holds a Master of Naval Architecture from the University of Tokyo, and served in Japan's Ministry of Transportation. "Throughout his role in government, he served as an outstanding policy maker in the maritime administration and assumed the role of Director-General of the Maritime Bureau in 2006," ClassNK said. He joined ClassNK in 2007, and was

appointed to Managing Director in 2010, followed by Executive Vice President in 2011. "He has so far commanded the expansion and development of the Society's certification services," it added. ClassNK has the world's top share of bulk carriers on its register and recently granted an approval for an LNG-fueled bulk carrier, contributing to the spread of environmentally friendly shipping practices.

NOVATEK, the Russian natural gas producer, completed the sale of an almost 10 percent stake in the Yamal LNG project in the Arctic region for \$1.20 billion to a Chinese equity fund because sanctions had mostly closed off Western financing. The LNG project is currently under construction in the Yamal Peninsula and when completed the first phase will comprise three liquefaction Trains each producing 5.5 million tonnes per annum for total output of 16.5 MTPA. Feed-gas for the venture, whose lead engineer is France's Technip, comes from the South-Tambeyskoye field, where reserves are estimated at 926 billion cubic metres of natural gas. The \$27-billion Russian Yamal venture's funding had been affected by international financial sanctions against Moscow over the Ukraine issue. The new Chinese funding has earned a share in the venture at a high discount compared with the original shareholders. The Silk Road Fund, a \$40 billion equity and development fund established in Beijing in December 2014, has been able to come with a short-term financing package for the Yamal venture at a time of high global risk for energy investment because of low oil prices. The fund focuses on infrastructure, energy, industrialization and financial cooperation for projects involving Chinese companies. The Chinese fund now has a significant share of the venture while reducing the stake of Novatek to 50.1 percent. French energy company Total and China National Petroleum Corp (CNPC) each hold 20 percent of the project, while newcomer Silk Road has its discounted 9.9 percent. The loans for Yamal LNG involve a 15-year loan from the Chinese fund amounting to 730 million euros (\$810M) and 357M euros of other financing organized by Novatek Chairman Leonid V. Mikhelson. He said that with the closing of the Chinese transaction, the project would "achieve the appropriate target shareholder structure, which will contribute to the planned financing of the project and

further facilitate its successful implementation.” The plant has been under construction for about 20 months and is scheduled to be completed by early 2018. Some of the contract work is being carried out at a fabrication facility in Qingdao in the northeast Shandong province of China. Yamal LNG has also signed a contract with Fluxys, owner of the Zeebrugge LNG import terminal in Belgium, to trans-ship cargoes from Western Europe to Asia during the Arctic winter when the use of shipping lanes to the Far East by the Northern Sea Route are closed because of ice. With a trans-shipment capacity at the Belgian terminal of 8 MTPA, the port of Zeebrugge will see a significant increase in ship movements, while other terminals in France may also handle some of the Russian trans-shipments because of French stakes in the project.

OMAN said serious talks have resumed on Iran using spare liquefaction capacity at the sultanate’s two LNG plants as a fast-track entry into the export market. Oman’s Minister of Oil and Gas, Mohammed bin Hamad Al Rumhy, again outlined the plan in a speech in the capital Muscat. The Iran-Oman LNG export plan was first muted about seven years ago though sanctions against the Iranians because of their nuclear policies meant the talks failed to advance. Discussions have become more serious with sanctions against Iran now lifted. Oman LNG comprising the two plants is 51 percent owned by the Omani government and its shareholders include Royal Dutch Shell and Total. Oman merged its two LNG plants under one operating company, Oman LNG, in 2013. Al Rumhy said that Oman LNG has current spare capacity of 1.5 million tonnes per annum, which could be used by Iran for liquefying their own natural gas delivered to Oman by pipeline. “That would be the sort of volume we are talking about,” Al Rumhy said. Al Rumhy said that there were “serious discussions” with Iran on building a 260 kilometres pipeline between the two countries for Oman to import Iranian natural gas. “Work is underway for identifying the optimum route. We are making progress. But this kind of project will take time,” the minister said. Oman LNG has three production Trains, with a combined capacity of 10.4 million tonnes per annum. The two-Train Oman LNG plant has 7.1MT of capacity and the one-Train Qalhat plant has 3.6MT of capacity.

Presently, the LNG produced from Oman LNG’s facility in Sur is mostly delivered to Japan and South Korea. Iran has signed an agreement to export 10 billion cubic metres of natural gas per annum to Oman in a deal that involves building the pipeline at a cost of about \$1 billion. Iran sits on the world’s largest gas reserves extending into the Persian Gulf and the resources are adjacent to those of Qatar, the world’s largest LNG producer. Oman said on March 21 it was rescheduling about 5 percent of its LNG cargo deliveries in 2016 as rising domestic demand affects the amount of feed-gas made available for the nation’s two export plants. Oman is requiring more natural gas to generate electricity and build up its industries to provide jobs and diversify its economy beyond oil, while still exploiting available resources. Rising natural gas consumption has previously prompted Oman LNG to say it would divert all its currently exported volumes of natural gas away from foreign markets and towards domestic consumers by 2024.

OPHIR ENERGY of the UK said it progressed on all fronts on the Fortuna floating LNG project offshore the West African nation of Equatorial Guinea, even as it posted an annual loss of \$376 million. Ophir said it was on track for a final investment decision on Fortuna FLNG in mid-2016. The pre-tax loss for Ophir comprised impairments due to lower commodity prices and exploration write-offs of \$149M. “In the period we delivered material progress on the Fortuna FLNG project, signing gas fiscal terms with the host government, securing Golar LNG as midstream provider, commencing front-end engineering and design, shortlisting binding offtake offers and signing a heads of agreement with Schlumberger to participate in the project,” said Nick Cooper, Chief Executive. Ophir signed an accord in February 2016 paving the way for the purchase by US energy services company Schlumberger of a 40 percent interest in the FLNG project. Ophir and Schlumberger are now working towards the project FID. Under the agreement Schlumberger will reimburse 50 percent of Ophir’s past costs. This is also expected to cover Ophir’s share of capital expenditures up until first sales of LNG. Golar, the Norwegian LNG fleet owner now based in Bermuda, is another stakeholder in Fortuna FLNG. Golar has signed an agreement to provide the former LNG carrier “Gimi” as a liquefaction hull to be placed over the Fortuna gas field.

“Through these steps, the forward funding requirements of the project will be met. In parallel through 2015, we also high-graded our exploration portfolio,” Cooper added in the earnings statement. “We radically reduced our cost base, and delivered synergies ahead of forecast on the Salamander acquisition,” said Cooper, referring to the exploration company it bought with four deepwater production-sharing contracts in Eastern Indonesia. Ophir’s Fortuna FLNG project would provide Equatorial Guinea with its second production venture. The nation has had an onshore liquefaction plant on Bioko Island since 2007 with a single Train producing 3.4 million tonnes per annum of LNG. The plant is operated by Marathon Oil and the volumes are now marketed by Royal Dutch Shell since its takeover of BG Group of the UK. “We can now confidently look forward four years, to first gas and revenues from the Fortuna FLNG project, knowing that we are fully funded,” said CEO Cooper. “Meanwhile, today we have further reduced our 2016 capital expenditure guidance to \$150M-\$200M as we continue to prioritise capital requirements. The upstream model of the past decade is clearly broken. Yet Ophir’s relatively strong financial position and quality asset base provide considerable optionality at this low point in the cycle,” Cooper stated. “Exploration costs are approaching 30-year lows and quality opportunities for future growth are plentiful. Provided we continue to focus capital at assets that can deliver strong returns in the ‘new normal’ of lower oil and gas prices then we are confident of driving superior net asset value growth,” he added. Ophir is also involved in an LNG production project in the East African nation of Tanzania, where “progress has been relatively disappointing” as momentum on the award of the land was slow prior to the presidential election in November 2015. “Since the election, the new President has moved quickly to demonstrate the Government’s commitment to the project by commencing the programme for the acquisition of the land,” Ophir said. The UK company admitted that it had made mistakes in the past. “When we look back on the recent period, it is clear that Ophir too made misjudgements and that we can sharpen our focus on value creation. At times we were drawn into high-risk commitment wells and chased look-alike plays with more haste than our geoscientists would have wanted. As a result, much deliberation has gone into

how Ophir can tighten up its model with a real focus on return on invested capital,” the company added. “Despite our mistakes, we feel Ophir’s track record is good. Ophir has demonstrated in Tanzania that it can monetise exploration success and we expect to provide further evidence of our ability to monetise our successes when we make an FID on the Fortuna FLNG project in 2016,” Ophir said.

RASGAS CO Ltd, the Qatari liquefied natural gas producer, celebrated a landmark in its LNG export operations at Ras Laffan when it loaded its 500th cargo to Taiwan under a long-term contract with CPC Corp. The cargo was loaded on March 5 on board CPC’s “Taitar No 4” carrier. The vessel’s name comes from the words Taiwan and Qatar. RasGas and CPC signed a second long-term contract in 2011 for the supply of cargoes. That accord increased the annual volume to over 5 million tonnes per annum. In addition, RasGas said it had delivered 72 cargoes, around 4.4 million tonnes of LNG to CPC on spot basis since 2007. RasGas and affiliated company Qatargas have 14 LNG Trains in production, including six of the world’s largest, enabling Qatar to produce 77 MTPA. Of this total, Qatargas has 43 MTPA of deliveries to make and RasGas produces around 37 MTPA for its customers. Taiwan previously imported more LNG than China, though Chinese Taiwan was overtaken in 2011 by the mainland. It still has significant contracts, including one with Malaysia that was renewed in 2014, and it also receives cargoes from the Asia-Pacific’s newest producer, Papua New Guinea. Taiwan, which most recently had LNG imports of 13.45 million tonnes, compared with 19.63MT imported by China, has two LNG import terminals at Yung-An and Tai-Chung compared with 14 now operated by the mainland. The Taiwanese are planning a third import terminal with capacity for an additional 5MT of imports and the facility is expected to be operational in two years. “As a long-term LNG supplier to CPC, RasGas is pleased to achieve this major milestone with our long-standing partners,” said Khalid Sultan R. Al Kuwari, Chief Marketing and Shipping Officer of RasGas. “We have come a long way since signing our first ever Sales and Purchase Agreement with CPC in 2005. Last year, we extended the partnership to joint corporate social responsibility (CSR) activities with CPC through the ‘Energising Education’



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initiative. We look forward to continuing to grow our relationship with CPC and the people of Taiwan even further,” said Al Kuwari. Rasgas said the “Energising Education” initiative benefits nine local schools in Taichung, Taiwan, where one of the LNG import terminals is located, “bringing tangible benefits to hundreds of students by providing improvements to educational resources and facilitates.”

REPSOL, the Spanish energy company, has postponed plans to convert its Canaport liquefied natural gas import facility in the Canadian Atlantic coast province of New Brunswick into an export plant for various reasons, including the drop in energy prices. The Repsol move is the latest cancellation of an LNG export project in Canada because of the energy industry downturn, as well as the anti-hydrocarbon energy policies of the federal government in Ottawa. The Canaport terminal is located in the coastal town of Saint John and is a joint venture between Repsol and Irving Oil Ltd. Repsol Canada spokesman Brent Anderson said that after a review of the conversion venture, the company had concluded the project was not economic at this time. “We’ve placed it on hold,” said Anderson. “The current market conditions and project challenges make it unattractive for third parties and off-takers to join the project,” the statement added. Other LNG export projects postponed in Canada recently have involved Royal Dutch Shell’s LNG Canada venture and the Douglas Channel project, both near the town of Kitimat in the Pacific coast province of British Columbia. Repsol and Canada’s Irving Oil developed the Canaport import terminal when North America was short of natural gas before the shale boom. The Spanish company had persevered with the Canaport terminal, opened in 2009, and in 2011 still managed to import 2.7 million tonnes of LNG into the glutted North American natural gas market. The cargoes came from Trinidad and Qatar. Repsol specifically held on to the Canaport terminal when it completed the sale in January 2014 of its LNG liquefaction assets in Peru and Trinidad to Royal Dutch Shell for over \$4 billion. The Canadian regulator, the National Energy Board, had awarded Canaport a permit in September 2015 to export cargoes to Europe and Asia from the facility once liquefaction capability was in place. The company’s plans at the time were to import 271 billion cubic feet of feed-gas from the US Northeast and

process it into LNG for export. In addition to retaining Canaport, the Spanish company had also kept its North American marketing and trading business for its future plans to purchase US feed-gas for export. The Repsol facility remains ideally placed to send low-priced US and Canadian gas into Europe as LNG. Conversion of Canaport into an export plant would have cost up to \$4 billion and the project had wide political support in New Brunswick, where the economy has been struggling. Three other Canadian LNG export plants are being developed further north in the province of Nova Scotia, also using part of the surplus US and Canadian pipeline natural gas supplies. One of the other options for the Canaport facility put forward by New Brunswick local politicians was to build up the LNG import market across the US border in New England. However, Canadian pipeline exporters were finding that market tough in the North American natural gas glut and gas sent south after being imported as LNG could only be sold profitably in exceptional circumstances.

ROLLS-ROYCE, the UK company known for powering Airbus and Boeing passenger jets, has won a contract to provide a propulsion package for a liquefied natural gas-fueled Norwegian cargo vessel being built at a Turkish shipyard and to be delivered in 2017. Rolls-Royce said the contract with Tersan Shipyard was worth US\$6.5 million and the marine engine using LNG will be fitted to a newbuild ordered by Norwegian shipowner NSK Shipping. The vessel will deliver fish food on behalf of the BioMar Group. “The new cargo carrier will be a slightly larger sister ship to NSK Shipping’s ‘MS Hoydal’ which was the world’s first LNG-powered cargo vessel and was delivered from Tersan Shipyard in 2012,” Rolls-Royce said. The 81.5 metres long vessel will be able to carry 2,700 tonnes of fish food to fish farms along the Norwegian coast. Helge Gjerde, Rolls-Royce President for Offshore and Merchant Solutions, said: “BioMar and NSK Shipping invest in modern technology that helps reduce fuel costs and environmental footprint. They are among the absolute frontrunners in the area of short sea shipping.” The LNG propulsion system comprises one eight cylinder Bergen C26:33 natural gas engine rated at 2160kW, a Promas combined rudder and propeller system, one tunnel thruster in the bow and one in

the aft and a Rolls-Royce automation and dynamic positioning system. The vessel is also equipped with the Rolls-Royce hybrid shaft generator (HSG) propulsion system. “This means the main engine also generates electricity for the ship. The Hybrid Shaft Generator will generate electrical power for the ship even if the engine power output varies, saving fuel. The HSG can also act as a propulsion motor (PTI) providing an alternative power source should LNG becomes unavailable - a prerequisite for class approval,” Rolls-Royce added. Bergen Gas Engines from Rolls-Royce are the only pure gas engines on the market using a spark-plug ignition. The UK company said alternative “dual-fuel” engines use a small amount of diesel for ignition. “We are proud to be trusted once again by BioMar to deliver their finished product to the fish farming industry and to be able to work with Rolls-Royce on the delivery of a more environmentally friendly and effective LNG powered vessel,” said Kristian Hoydal, NSK’s Managing Director. NSK Ship Design designed both LNG vessels for BioMar. “We are thrilled that our designs have contributed to the use of LNG in powering cargo vessels, therefore reducing carbon footprints,” said Kjartan Karlsen, MD of NSK Ship Design. “We commend NSK Shipping and Rolls Royce for being at the helm of a more sustainable industry,” Karlsen added. Rolls-Royce is building up its LNG propulsion profile. It won a contract in March 2015 from Keppel Shipyard in Singapore to supply two all-gas engines for a floating liquefaction vessel owned by Golar LNG, the Norwegian LNG carrier fleet owner and project developer. The vessel “Hilli” was a former LNG carrier and is being converted into a Floating LNG hull by the Keppel yard. The UK company’s energy unit also won a contract from the US Lake Charles LNG export project in Louisiana for industrial turbines to power its liquefaction Trains. SKANGAS, a unit of Finland’s natural gas company Gasum, and the Lyse Group have signed an agreement for the sale of the Norwegian Risavika small-scale LNG production plant. Gasum said its acquisition of the Risavika production plant would strengthen Skangas’s presence in the downstream of the LNG value chain and secure Skangas’s commercial position in the Norwegian market and North Sea. The Risavika plant has an annual production capacity of 300,000 tonnes per annum of LNG and a storage tank for 30,000 cubic metres.

Gasum said the acquisition also included an LNG marine bunkering facility. “Under the tolling agreement signed in 2014, we have bought the full annual capacity of the Risavika LNG plant,” said Gasum Chief Executive Johanna Lamminen. “The acquisition of the plant puts the final pieces in place in the overall acquisition of Skangas. This acquisition is part of our LNG business development and further strengthens our position as the leading LNG player in the Nordic market,” added Lamminen. Skangas Chief Executive Tor Morten Osmundsen was also pleased with the takeover of the Risavika plant. “The acquisition will strengthen our position in the growing LNG market, increase our overall storage capacity and improve our current and future customers’ access to LNG under long-term and competitive conditions,” said Osmundsen. Gasum acquired the majority of Norway’s Skangas distribution operations from the Lyse Group in 2014, with the transaction including a purchase option for the Risavika LNG plant. “The acquisition was part of Gasum’s strategy to improve the availability of competitive LNG in the Nordic countries,” the Finnish company said. The acquisition of the Risavika plant is subject to approval by competition authorities in Sweden and Norway.

SWEDEGAS, the operator of the gas transmission grid in Sweden, said it was examining the potential for a liquefied natural gas terminal and storage facility as well as a small-scale barge shipping and bunkering joint venture in a central coastal area of the country. The Swedish gas company said it was aiming to establish more gas infrastructure in the Gävle region in the historical Northern Lands area. The company has signed a memorandum of understanding with Kanfer Shipping of Norway for a potential venture involving the transport of LNG by sea as well as an LNG storage facility in Gävle. Swedegas is currently in discussions with Kanfer about what form “a flexible and robust solution” for supplying the region with LNG and gas might take. This could involve LNG being transported to a port on barges pushed by tugs. The barges would then function as floating storage facilities at the port. “From there, the LNG, following regasification, can be transported onwards in the Swedegas network,” it explained. The LNG barges are based on the US Articulated Tug Barge (ATB), a patented vessel design also called a push barge. “This concept is

favourable from an operating cost point of view, which will benefit customers in the region,” said Johan Zettergren, Swedegas Vice President. The Swedegas investment plan will include a regional gas network and an LNG terminal. “A solution of this nature would provide industry and the transport sector, including shipping, with the opportunity to access competitive, sustainable energy as they gradually make the transition from oil-based products to more eco-friendly alternatives,” Swedegas said. “Gas will be used as it is safe, easy to handle and more environmentally viable than oil and coal,” Swedegas said. “The region's biogas production could also increase with the establishment of a more efficient distribution system,” it added. “We are striving to find competitive and flexible solutions for the entire gas value chain and are currently analyzing different options to find the most efficient one,” said Zettergren, who in July 2016 takes over as Chief Executive of Swedegas on the retirement of incumbent Lars Gustafsson. Kanfer will conduct a preliminary study to allow the parties to proceed towards a decision on the future of the project. “We are extremely pleased with the confidence Swedegas has shown in us and we are looking forward to being involved in the project in the future,” said Stig Anders Hagen, managing partner at Kanfer Shipping. “The aim is to work together over the next year to have a complete gas infrastructure solution in place,” Hagen added.

TOKYO GAS, Japan's third-largest LNG importer, has started full commercial operations at the nation's latest import terminal at Hitachi port in a network now numbering 33 regasification and satellite facilities. Togas said it had started full operations at the Hitachi regasification terminal in the main port area of Ibaraki prefecture northwest of Tokyo on the Pacific coast. The terminal is the first constructed by Togas located outside of Tokyo Bay and has storage capacity of 230,000 cubic metres of LNG in a single tank. The Hitachi terminal has already received three cargoes since January 2016, one from Malaysia's Bintulu plant and two from Russia's only LNG export plant at Sakhalin in the Far East. In addition to building the Hitachi facility, the Japanese utility has also been upgrading its three LNG import terminals on Tokyo Bay, Negishi, Ohgishima and Sodegaura. The new Hitachi terminal has also incorporated

the add-ons adopted by the newest European import terminal such as re-loading facilities for domestic LNG carriers as well as a six-lane truck-loading area for small-scale fuel distribution. In conjunction with the start of operations at the Hitachi LNG terminal, Togas also began delivering natural gas via the newly constructed Ibaraki-Tochigi pipeline of 80 kilometres in length. The Ibaraki-Tochigi interconnect is a high-pressure trunk line that runs from Hitachi city in Ibaraki prefecture to the city of Moka in Tochigi prefecture. “The company began construction of the Hitachi LNG terminal and the Ibaraki-Tochigi Line in 2012 in order to meet the future growth of gas demand towards 2020,” Togas said. The Japanese utility is also building a second LNG storage tank and will bring it into operation by 2020. “The company will also improve the energy security in the Kanto region by looping high-pressure trunk lines through the connecting and existing Kashima Waterfront Line and Ibaraki Line,” it added. The last import terminal completed in Japan was the Hachinohe facility completed in 2015 for JX Nippon Oil, a shareholder in the Papua New Guinea LNG production plant and was the 32nd terminal in the Japanese network. Another facility, the Kushiro LNG terminal in Hokkaido, serves as a satellite receiving terminal for LNG coastal tankers from Hachinohe. Japan has gradually been building up its network of regasification facilities and there was a new urgency after the Fukushima disaster led to the closure of the more than 50 nuclear plants in the country. So far only two nuclear plants have come back into full service and are currently operating. Japan imported 85.04 million tonnes of LNG in 2014 compared with the record 88.51MT in 2014, a fall of 3.9 percent. The total cost of LNG shipments for the whole of 2015 in dollar terms amounted to \$46.6Bln compared with \$66.1Bln in 2014 as prices have fallen in line with oil. The year before the Fukushima nuclear and tsunami disaster of March 11, 2011, Japan imported 70.00MT of LNG. In 2011 when the disaster occurred, the annual LNG imports were 78.53MT, followed by 87.31MT in 2012, 87.49MT in 2013 and the record 88.51MT in 2014.

TOTAL Chairman and Chief Executive Patrick Pouyanne has signed an agreement in Beijing with China National Petroleum Co. (CNPC) to extend

their cooperation on energy and LNG projects, beyond those currently underway including the Yamal LNG project in Russia. Pouyanne signed the French energy company's latest pact with his counterpart at CNPC, Wang Yilin. “This strategic cooperation agreement reflects our respective commitment to strengthening our partnership and jointly developing new projects,” said Pouyanne at the signing ceremony. “The agreement further strengthens the existing partnership to support the international strategy of CNPC's affiliate PetroChina,” said the Total CEO. In the past 10 years, Total and CNPC have formed a number of partnerships involving major projects, including the Sulige natural gas field in Inner Mongolia, China, and Yamal LNG in Russia. Total is a shareholder in the Russian energy company Novatek, which owns 50.1 percent of Yamal LNG. The French company and CNPC each hold 20 percent of the project, while Chinese funding is underpinning the construction of the liquefaction plant and export terminal. The current CNPC-Total LNG collaboration is on one of the world's most challenging LNG projects. The venture is located in the Yamal Peninsula deep in the Russian Arctic, a region that is ice-bound for seven to nine months of the year. More than 200 wells will be drilled for the project involving three liquefaction Trains, each with a capacity to produce 5.5 million tonnes per annum of LNG. To ensure its stability, the plant will be supported by tens of thousands of piles driven some 20 metres into the permafrost. For the transport of equipment and construction teams, the port of Sabetta and an airport had to be built from scratch. Over the next couple of years until the end of 2017, the port of Sabetta is taking delivery of 150 modules representing 450,000 metric tonnes of equipment. Also specially designed to operate when Yamal is completed are 15 LNG ice-breaker carriers, each of which has a capacity of 170,000 cubic metres.

WOODSIDE, the Australian liquefied natural gas operator has cancelled the planned Browse floating LNG joint venture offshore Western Australia because of the current economic and market environment. Woodside said in January 2016 it was studying costs in relation to the Browse FLNG venture it was developing with Royal Dutch Shell, BP of the UK, PetroChina and Japan's Mitsui and Mitsubishi. The Australian company had at the time “progressed

well” on delivering targeted cost savings and improving project value during the front-end engineering and design. Work continued on a range of activities related to the commercialization, timing and sequencing of the Browse FLNG development before a final investment decision - now taken. The Browse FLNG project proposed developing the Brecknock, Calliance and Torosa gas fields in the Browse Basin, which are estimated to contain around 15.4 trillion cubic feet of dry gas, and producing LNG offshore using Royal Dutch Shell FLNG technology. The Browse Basin is located about 425 kilometres north of the town of Broome in Western Australia. Woodside Chief Executive Peter Coleman acknowledged the high quality of technical and non-technical work completed on the Browse FEED programme to enable the Browse joint venture participants to reach this decision. “We have undertaken a comprehensive and rigorous process to assess all elements of the development. The decision represents a disciplined approach to large-scale capital investment and is consistent with our requirements for a development concept to be commercially robust across a range of scenarios. Woodside remains committed to the earliest commercial development of the world-class Browse resources and to FLNG as the preferred solution, but the economic environment is not supportive of a major LNG investment at this time,” Coleman stated. The Browse LNG project had originally been conceived as an onshore venture and was moved offshore to save on costs. The present plan was to use a Shell FLNG hull design currently under construction for the Prelude FLNG project offshore northwest Australia, also using Browse Basin resources. The Australian company said it remained focused on satisfying its work programme commitments under the Browse retention leases. The Browse retention leases were renewed in 2015 and the current term of the leases ends in mid-2020. Woodside will now work with the participants to prepare a new work programme and budget to progress development activities. “Woodside intends to leverage the high quality work delivered to date, which includes the involvement of the State Government to agree key principles for domestic gas and supply chain arrangements and the State and Commonwealth Governments to manage maritime boundary changes,” the company said. ■

Germany maintains Cold War on LNG as it continues to rely greatly on Russian pipelines

Germans are sole EU nation to shun large-scale LNG imports in favour of a pipeline strategy

Germany's transition to the cleaner fuel era is not depended on liquefied natural gas, unlike its West European neighbours, but on Russian pipeline natural gas company Gazprom.

Alone among major European Union economies, Germany currently has no LNG import facilities nor any projects.

Gas pact

Instead, Europe's largest economy is forging closer pipeline ties with Gazprom as the Russian natural gas giant also acquires more natural gas assets in Germany.

Germany has no current plans to build an LNG import terminal and is content to develop small-scale LNG fuel operations.

However, it recently completed its first marine bunkering operation at the Baltic port of Rostock - with the help of Gazprom and organised by the Russian company.

More than 900 natural gas filling stations for fuel are now available to customers across Germany, mostly compressed natural gas rather than LNG.

Gazprom plans to be operating at least 50 of these stations by the end of 2016.

Germany and Gazprom are building closer ties in the fields of East-West pipeline connections, storage facilities in Germany and the Russian acquisition of Germany's Wingas

Wingas was founded at the beginning of the 1990s and has been a driving force on the German natural gas market and was part of energy company Wintershall.

Supplier

Now owned by Gazprom, it supplies customers in Germany as well as delivering gas to Belgium, France, the UK, Austria, the Netherlands and the Czech Republic.

"Germany has traditionally been Gazprom's most important partner, largest foreign customer, and most important market in Europe," Gazprom said in a published overview of the German-Russian pipeline gas pact.

"The Russian company's acquisition of Wingas only serves as further affirmation of our commitment to the country.

"One of the main topics covered in this special focus is the role natural gas is

playing in Germany's energy transition," Gazprom said.

"We truly believe that natural gas is poised to gain further importance as a reliable, environmentally friendly energy source.

"Indeed, without a gradual increase in the use of natural gas in generating electricity, Germany's energy transition - and in particular, its campaign to reach its climate goals - can hardly be overcome," the report said.

Gazprom's German subsidiary is pressing ahead with the huge Under Ground Storage Katharina project in the town of Peissen in the German state of Saxony-Anhalt in the former East Germany and whose capital is Magdeburg.

Nord Stream

The Russians are also proposing the extension of the Baltic Sea pipeline Nord Stream.

"These are two major projects in which we'll be working with our partners to continue to supply Europe with a secure supply of energy," Gazprom said.

Gerhard Koenig is Chairman of the board of Gazprom acquisition Wingas, which became a wholly-owned subsidiary of the Russian company in October 2015.

Koenig talks about the deal, integration of Wingas and the company's strategy for the future.

"Outside our companies many people also realized that the asset swap between Gazprom and Wintershall offered major opportunities for all sides, both East and West alike.

"It would give Wintershall, as the first German company, direct access to Russian natural gas sources, and a Russian company, Gazprom, would be investing in natural gas trading and gas storage across the EU. It is hardly possible to create more supply security for Europe," said Koenig.

Reliant

"An appropriate and dependably secure energy supply for Europe is only possible with Russia and with the acquisition of Wingas, including our storage subsidiary Astora," he added.

"With its investment in Nord Stream

Germany Natural Gas Price



Germany's natural gas price evolution into the 2015 period

and the downstream pipeline network in Germany, Gazprom is the only notable energy producer that is actively contributing towards supply security on the market and is investing in supply security locally," he said.

"For this reason, I don't like the word dependence. Gazprom is a reliable supplier that is investing billions in European gas infrastructure. It is therefore very much in Gazprom's interests to keep the gas flowing to Europe.

"With our storage subsidiary Astora the Wingas Group has over a fifth of Germany's storage capacities at its disposal, and thus makes a really important contribution to the country's supply security.

"With its 4.4 Bcm of working gas, the Rehden storage facility alone, which is the largest storage facility in Western Europe, forms the backbone of German natural gas supply.

"The foreseeable continuing decline of Europe's own production, additional natural gas imports will be necessary, which means the importance of natural gas storage will also grow.

"Those who think we can replace fossil fuels completely in the near future are wrong. An energy supply system that relies solely on renewable energies is not feasible yet.

"It needs a secure and permanently available source of energy that can step in when the wind is no longer blowing or the sun is not shining," he explained.

"Natural gas can do this. Natural gas is efficient, can be used in many applications, is available in plentiful supply and has the lowest emissions out of all the fossil fuels.

"And in light of the burgeoning global population, on a global level the demand for energy will continue to grow in the coming decades too. Natural gas will play a key role in meeting this demand," Koenig stated.

"When you look at Germany's energy transition, it quickly becomes clear that the original purpose of the transition, i.e. to protect the climate, is not being served.

"Carbon-dioxide (CO2) emissions are increasing even though the German people now spend 25 billion euros (\$28.5Bln) every year on subsidies for renewable energy.

Affordable

"Climate protection would be much more affordable with natural gas," the CEO said.

Some facts about German-Gazprom natural gas links:

- Over seven days, natural gas covers about 5,000km in travelling from West Siberia to Germany. That equals more than three times the distance between Berlin and Moscow
- Gazprom's gas pipeline network comprises 169,000km, making it by far the longest in the world. It could circle around the world more than four times
- In 2015, Gazprom set an all-time record in delivering 45.30 Bcm of natural gas to Germany

- About 40 percent of Germany's natural gas supply comes from Russia. The Russian company provides 21 percent of Germany's primary energy consumption.

The Gazprom report also stated that the argument that the German natural gas market was still rather healthy overall may seem a bit surprising.

Natural gas has, of course, faced tremendous headwinds in the power production sector for years.

Contributor

Despite it being the least carbon intensive fossil fuel, natural gas' contribution to the power generation sector dropped between 2010 and 2014.

"According to preliminary data, this downward trend continued in 2015 by a further 7 percent," the report said.

"Even in the power sector, however, there are faint signs of potential improvement: In 2015, the German government began discussing a plan to phase out coal due to its adverse effects on the country's 2020 emission targets.

"The government has achieved only meagre success thus far, with its main idea involving the decommissioning of old lignite plants and longer hours of operation at more efficient hard coal power stations.

"Nevertheless, these discussions have had some minor positive results for natural-gas-fired power plants, including in the amendment of Germany's legislation on combined heat and power (CHP) that passed the country's two houses of parliament and took effect on 1 January 2016.

"This amendment calls for efficient existing natural-gas-fired power plants to receive an extra subsidy of 1.5 cents/kWh for a four-year period to prevent them from ceasing operations due to the difficult conditions in their sector," Gazprom said.

State aid

In addition, new natural-gas-fired plants that replace old coal-fired plants will also receive special remuneration.

These incentives notwithstanding, it should be emphasized that much more must be done to enable pipeline natural gas to play a greater role in power generation in Germany in the near term in the absence of alternatives such as LNG.

Most observers in Germany doubt that this will occur, although the recent Paris Agreement on CO2 issues should put more pressure on the use of coal for power generation.

"All in all, a more intensive discussion about phasing out coal-based scenarios may finally improve conditions for natural gas," Gazprom said.

"Natural gas is the fuel of choice for German households. In fact, many local utility representatives are satisfied with their business in the segment and report increasing numbers of customers who are switching from oil to natural gas.

"New German regions are even being connected to natural gas grids despite differing views on the extent to which this is still economically feasible.

"Official statistics show that roughly 50 percent of all new buildings are heated with natural gas, and the fuel's market share in existing buildings is also around

50 percent," the report added. Meanwhile, the German Federal Ministry for Economic Affairs has laid out a clear vision for dramatically reducing the country's use of natural gas in the long run (by 70-80 percent by 2050 compared to 2008), either by improving building insulation or by replacing natural gas with renewable energies.

"For the natural gas industry, the main challenge in 2016 will be to convince policymakers that picking the lowhanging fruit in reducing emissions, by supporting efficient gas heating systems, will be more efficient than betting directly on expensive alternatives," Gazprom said.

As mentioned earlier, Russia is also helping Germany expand its natural gas storage facilities.

In Peissen, near Bernburg, in Saxony-Anhalt, the new underground storage facility called Katharina is currently being constructed.

Its caverns reach heights of around 220 metres and extend to depths of up to 700 metres.

Imperial storage

"The Katharina storage facility - named after the Russian empress Catherine the Great - is operated by Erdgasspeicher Peissen GmbH (EPG), a Verbundnetz Gas-Gazprom Germania joint venture," Gazprom said.

"This long-established Leipzig-based company and the German subsidiary of Gazprom Export invest in supply security and are able to look back on more than 40 years of energy-related, German-Russian partnership," the Russian company said.

Overall, the Russian subsidiary

Gazprom Germania is involved in nine storage facility projects around Europe - not only in Germany, but also in Austria, the Netherlands and in Serbia.

The Katharina storage system is scheduled to be completed in April 2017.

At that point five of the 12 caverns in total will be operational and the system will be linked to the European natural gas network.

Germany will then have Europe's largest storage systems with a total of 47 underground facilities across the country balancing out fluctuations in consumption.

Stockpile

"They are filled during the summer when gas demand is low, to enable them to be used to cover the increased demand during the winter months," Gazprom said.

"With a total volume of 23 Bcm, their capacity roughly corresponds to one quarter of the total annual German demand.

"In the context of the German energy transition, in which the country's long-term energy supply is being converted to renewable energy sources, the importance of gas storage facilities will probably even increase.

"That's because when no wind blows and the sun does not shine, flexibly operating natural gas-fired power stations will contribute to long-term power grid stability," the report said. ■

This article is based on extracts and interviews from the Gazprom's monthly company publication "Blue Fuel".

LNG *journal*

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Class society DNV GL updates practice on metering for new LNG bunkering facilities

Martin Layfield, DNV GL global segment leader of the Gas Value Chain

As the international market for small-scale LNG and bunkering expands globally, the need for safety and enhanced commercial practices are increasingly important and are being addressed by DNV GL through an updated Recommended Practice.

LNG has proven to be a viable option as a bunkering fuel for ships and its use is set to soar over the next decade.

LNG is currently available as a bunker fuel for maritime and inland shipping at a number of ports across Europe, the US and especially in South East Asia (see Figure 1), and infrastructure development is being planned in several ports globally.

Risk management

The management of the risks associated with LNG use as a fuel continues to be developed, especially as the supply is not yet widely carried out on a routine basis.

Key differences to traditional marine fuels include the low flashpoint and cryogenic temperature.

As energy demand grows and the industry looks to monetize the use of gas globally, another aspect that requires attention is the fact that LNG is produced at different locations around the world.

This results in LNG compositions that may vary

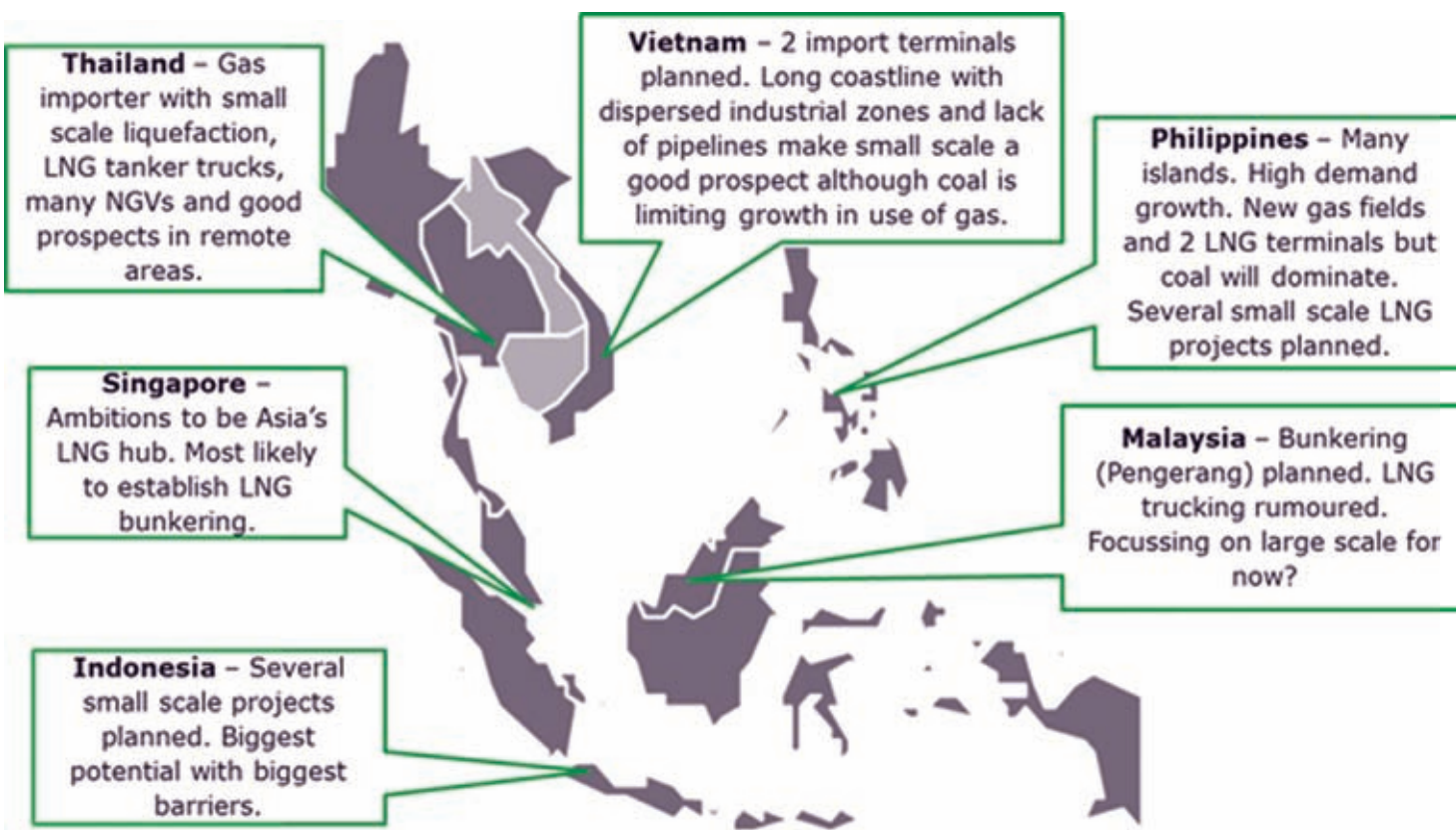


Figure 1: Small-scale LNG outlook in South-East Asia region

substantially with the geographical origin due to differences in natural gas sources, production technologies and the target market.

These various compositions of LNG need to be addressed in terms of equipment requirements and operating procedures to accommodate appropriate billing (trading) and fuel quality

quantity by volume and mass) to ensure fair and robust commercial value.

Composition is also of great importance from a safety point as the maximum filling limit in fuel tanks need to reflect the LNG properties for potential expansion to avoid liquid-full tanks and further to determine the performance of engines and turbines.

Practice

In order to tackle the challenges that varying LNG compositions cause, DNV GL is now launching an update of the Recommended Practice (RP) on *Development and operation of liquefied natural gas bunkering facilities* (DNVGL-RP-G105) to help the industry maximize the commercial value for fuel suppliers by de-risking fuel use for the customer.

Currently there is no international standard which determines classification and specification for LNG as a marine fuel and required metering methodology.

The RP is established with the aim of supporting the industry in the development and operation of safe LNG bunkering facilities and to ensure safety for people, the environment and

compliance with regulatory targets.

It focuses on four main elements: safe design and operation, safety management systems, risk assessment and now, for the first time, coverage on gas quality and metering.

The RP bridges the gap between the ISO/TS 18683 (which by its very nature is generic) and site-specific regulations like port regulations, terminal procedures and operating procedures (OP) for LNG bunkering.

The scope of the guideline covers all activities and stakeholders involved in the development and operation of such facilities (see Figure 2).

It also addresses the risk evaluations that may be used for strategic considerations in the planning phase of an LNG bunkering facility project.

The RP is applicable to truck-to-ship, terminal-to-ship and ship-to-ship bunkering scenarios as well as vessels covered by the International Maritime Organization (IMO) regulations including inland shipping.

Quality and quantity

Through this update of the RP, DNV GL is

As energy demand grows and the industry looks to monetize the use of gas globally, another aspect that requires attention is the fact that LNG is produced at different locations around the world.

UK LNG valve maker meets high demand for high-pressure management of fuel gas

Duncan Gaskin looks at the cryogenic valves sector for ship propulsion

Since legislation was put in place in 2015 that controlled sulphur emissions in designated Emissions Control Areas, there has been a greater focus within the shipbuilding industry on the use of cleaner fuels such as liquefied natural gas.

Ships operating in these designated ECAs have to use fuel oil on board that has a sulphur content of no more than 0.10 percent.

Control areas

The stricter rules are governed by the International Convention for the Prevention of Pollution from ships (MARPOL) Annex VI (Regulations for the Prevention of Air Pollution from Ships) which covers emissions of sulphur oxides (SOx) and particulate matter.

The emission control areas established under MARPOL Annex VI for SOx are: the Baltic Sea, the North Sea, the North American area (covering designated coastal areas off the United States and Canada); and the United States Caribbean Sea area around Puerto Rico and the US Virgin Islands.

This has led to an increasing number of ships making use of LNG as a marine fuel, as it contains no sulphur and negligible sulphur oxide emissions.

The main types of ships to have used LNG as a marine fuel so far have been small ferries or cruise and offshore vessels.

In future, it is anticipated that a much wider variety of type and size of ships will start to use LNG as their main fuel.

Majority

Of the LNG Fuel Gas Systems (FGS) produced so far, the majority have been low-pressure systems with a maximum system pressure of 10bar pressure and there are a wide range of companies which can supply cryogenic valves for these systems.

UK-based LNG valves company Parker Bestobell Marine is a key supplier of such valves.

The valves company, based in Sheffield, England, has also developed a new range of high-pressure globe valves that are fitted to the fuel-gas systems for the electronically-controlled Gas Injection (ME-GI) engines built by Germany's MAN Diesel & Turbo, a subsidiary of automaker Volkswagen.

With the introduction of the MAN ME-GI 2-stroke gas engine, high-pressure FGS

are now set to become a familiar sight in the engine rooms of a variety of ships.

The supply of equipment for high-pressure FGS is a much more specialist area as these systems operate at 370Bar pressure and higher.

The MAN ME-GI engines that were launched in the past 12 months require the gas to be injected at around 320Bar into the engine cylinders to ensure effective combustion takes place.

MAN is now developing the same engines to burn ethane and these require the gas to be injected at over 400Bar pressure.

This has led to a requirement for cryogenic valves to be developed which can withstand these even higher pressures and is the reason why so much innovation has taken place in the business to meet these requirements.

The latest MAN ME-GI engines enable efficient ship propulsion and offer lower emission values that can assist with meeting current environmental limits in ECA areas.

They also contribute to an overall improvement in energy efficiency. A high-pressure gas injection dual-fuel, two-stroke engine with higher system efficiency offers a significant reduction in emissions for LNG carriers, as well as other ocean-going vessels.

This has created a market opportunity for specialist marine cryogenic valve manufacturers, like Parker Bestobell to respond with high-pressure valves.

Innovation within the UK company's product portfolio meant it developed a new range of Class 2500 and Class 4500 valves that can operate to over 500Bar pressure.

Prototypes

These valves are required to be prototype tested and to be fully approved by the relevant marine classification societies. This is a rigorous process and one where experience in the marine sector is vitally important.

The new range of high-pressure valves are required for FGS where ethane is used as the fuel. Liquid Ethane has not traditionally been carried on ships, but with the development of the shale-gas fields in the US, not only are there large quantities of methane (natural gas) but also wet gases like ethane, propane and butane, which can also

be used as a fuel when carried as a cargo.

Manufacturers of high-pressure cryogenic valves, which may be looking to expand their markets by moving into the marine sector, would have to adapt their products to suit marine requirements and, more importantly, to understand how to get their products approved.

Learning curve

For companies that do not already operate in the marine sector, this is a huge learning curve to understand marine rules and there is great difficulty in doing so as the requirements of the marine classification societies are very exacting.

There are many considerations for the marine industry when specifying high-pressure valves.

Valves must have a valid prototype test certificate issued by one of the major classification societies - this means being tested to 1.5 x design pressure.

They must also have a Type Approval from each of the class societies. In addition, they must be fire safe - so all components can withstand a temperature of 925 degrees centigrade or above, without leaking.

All valves must be of stainless steel design, with butt weld end connections for the liquid phase and 100 percent ambient testing may be required of the seat and body of the valve, and 10 percent cryogenic testing of each size and type of valve.

In addition, full 3.2 document/certification traceability is required on all casting and billets.

All valves - whether high or low pressure - need to comply with the class society rules. Meeting these rules was essential when last year Parker Bestobell secured its first order to supply its cryogenic high-pressure globe valves to Daewoo Shipbuilding & Marine Engineering Co. Ltd. of South Korea.

These valves have been developed over the past two years and for DSME they are designed to withstand a maximum pressure of 370 Bar and will be fitted in the gas phase piping of the FGS, downstream of the boil-off gas compressors and the evaporators.

Installation

They will be installed on the five 174,000 cubic metres capacity LNG carriers (LNGC) being built by DSME for the shipping line Teekay.

There has been a number of new orders for

the MAN ME-GI gas engines in recent months, with upwards of 30 new vessels contracted that will use this type of engine.

This means that there is now a new requirement for 30 high-pressure FGS to supply the gas for these engines. In total, there are around 50 vessels contracted with MAN ME-GI engines across the world.

MAN ME-GI engines have now been adopted by DSME for its LNG carrier newbuilds and they are offered to owners in conjunction with DSME's Hi-VAR FGS that includes a partial reliquefaction system.

This can liquefy excess boil-off gas (BOG) from the cargo tanks that is not used for the fuel.

It has proven to be very attractive to ship owners, as it offers them substantial savings in running costs of the vessels and as a result of this, DSME has taken a much larger share of the Korean newbuild market for LNG vessels compared to its competitors.

Experience

Parker Bestobell has extensive experience in supplying this market after being contracted to supply valves for nearly 200 ships and have over 35,000 cryogenic valves fitted on vessels.

In future, there is set to be significant growth in the marine sector for high-pressure cryogenic valves, as more ship owners are adopting the MAN ME-GI engines for their newbuild vessels.

MAN is also working proactively to market these gas engines to ship owners, securing a higher level of sales.

It is currently only the MAN engine that requires the high-pressure gas injection, so the application is only limited, in terms of the overall gas engine market, to the ME-GI system.

However, MAN does command about 80 per cent market share of the two-stroke engine market, so there are major opportunities here.

Parker Bestobell, therefore, sees a great potential for growth in the supply of cryogenic valves for fuel gas systems. As marine engine design is set to require ever higher pressures, the UK company has pledged to continue to innovate in this area. ■

The author, Duncan Gaskin, is Market Development Manager at Parker Bestobell Marine, part of Parker Hannifin - the global leader in motion and control technologies.

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
Abdelkader	177,000	MOL-Itochu	Hyundai	Feb-09	Panama	DFDE	TZ Mk. III	4	Various
Adam LNG	162,000	Oman LNG	Hyundai	Dec-14	Marshall Is.	DFDE	TZ Mk. III	4	Oman LNG
Al Aamriya	210,100	J5 Consortium	Daewoo	Feb-08	Marshall Is.	DRL	GT NO 96	4	Qatargas
Al Areesh	151,700	Teekay LNG	Daewoo	Jan-07	Qatar	S	GT NO 96	4	Ras Gas II
Al Bahiya	266,000	QGTC	Samsung	Oct-09	Liberia	DRL	TZ Mk. III	5	Qatar-Atlantic
Al Biddah	135,275	J4 Consortium	Kawasaki Sakaide	Nov-99	Japan	S	Moss	5	Qatargas
Al Daayen	151,700	Teekay LNG	Daewoo	Apr-07	Qatar	S	GT NO 96	4	RasGas II
Al Dafna	266,000	QGTC	Samsung	Oct-09	Marshall Is.	LR DRL	GT NO 96	4	Qatar-Atlantic
Al Deebel	145,000	Peninsular LNG	Samsung	Dec-05	Bahamas	S	TZ Mk. III	4	Qatargas
Al Gattara	216,200	OSG/Nakilat	Hyundai	Oct-07	Marshall Is.	DRL	TZ Mk. III	4	Qatargas II
Al Ghariya	210,100	ProNav	Daewoo	Feb-08	Bahamas	DRL	GT No. 96	4	Qatargas
Al Gharaffa	216,200	OSG/Nakilat	Hyundai	Jan-08	Marshall Is.	DRL	TZ Mk. III	4	Various
Al Ghashamiya	216,000	QGTC	Samsung	Mar-09	Liberia	DRL	TZ Mk. III	4	Qatar-Atlantic Basin
Al Ghuwairiya	261,700	QGTC	Daewoo	Aug-08	Marshall Is.	DRL	GT NO. 96	5	Qatar-Atl'c Basin
Al Hamla	216,000	OSG	Samsung	Feb-08	Marshall Is.	DRL	TZ Mk. III	4	QatarGas
Al Hamra	137,000	National Gas Shipping	Kvaerner-Masa	Jan-97	Liberia	S	Moss	4	ADGAS
Al Huwaila	217,000	Teekay	Samsung	May-08	Bahamas	DRL	TZ Mk. III	4	RasGas III
Al Jasra	137,100	J4 Consortium	Mitsubishi Nagasaki	Jul-00	Japan	S	Moss	5	Qatargas
Al Jassasiya	145,700	Maran-Nakilat	Daewoo	May-07	Greece	S	GT No 96	4	RasGas
Al Kharaitiyat	216,200	QGTC	Hyundai	May-09	Liberia	DRL	TZ Mk. III	4	Qatargas III
Al Kharaana	210,000	QGTC	Daewoo	Oct-09	Marshall Is.	DRL	GT NO 96	4	Qatargas IV
Al Kharsaah	217,000	Teekay	Samsung	May-08	Bahamas	DRL	TZ Mk. III	4	RasGas III
Al Khattiya	210,000	QGTC	DSME	Oct-09	Marshall Is.	DRL	GT No. 96	4	Qatargas IV
Al Khaznah	135,500	National Gas Shipping	Mitsui Chiba	Jun-94	Liberia	S	Moss	5	ADGAS
Al Khor	137,350	J4 Consortium	Mitsubishi Nagasaki	Dec-96	Japan	S	Moss	5	Qatargas
Al Khuwair	217,000	Teekay LNG	Samsung	Jul-08	Korea	DRL	TZ Mk. III	4	RasGas
Al Mafyar	266,000	OSG/Nakilat	Hyundai	Oct-07	Marshall Is.	DRL	TZ Mk. III	4	Qatargas II
Al Marrouna	151,700	Teekay	Daewoo	Nov-07	Bahamas	S	GT NO 96		Ras Gas I
Al Mayeda	266,000	QGTC	Samsung	Jan-09	Liberia	DRL	TZ Mk. III	5	Qatar-US/Var.
Al Nuaman	210,000	QGTC	DSME	Dec-09	Marshall Is.	DRL	GT No. 96	4	Qatargas IV
Al Oraiq	210,000	J5 Consortium	Daewoo	Apr-08	Marshall Is.	DRL	GT No. 96	4	Various
Al Rayyan	135,360	J4 Consortium	Kawasaki Sakaide	Mar-97	Japan	S	Moss	5	Qatargas
Al Rekayyat	216,200	QGTC	Hyundai	Jun-09	Bahamas	DRL	TZ Mk.III	4	Qatar-Atlantic
Al Ruwais	210,100	ProNav	Daewoo	Nov-07	Germany	DRL	GT NO 96	4	Qatargas II
Al Sadd	210,100	QGTC	Daewoo	Mar-09	Liberia	DRL	GT NO 96	4	Qatar-Atlantic Basin
Al Safliya	210,100	ProNav	Daewoo	Dec-07	Bahamas	DRL	GT NO 96	4	Qatargas II
Al Sahla	216,200	J5	Hyundai	Jun-08	Japan	DRL	TZ Mk. III	4	Ras Gas III
Al Samriya	261,700	QGTC	Daewoo	Sep-08	Marshall Is.	DRL	GT NO. 96	5	Qatargas II
Al Sheehaniya	210,100	QGTC	Daewoo	Feb-09	Liberia	DRL	GT NO 96	4	Qatar-Atlantic Basin
Al Shamal	217,000	Teekay LNG	Samsung	Jun-08	Qatar	DRL	TZ Mk. III	4	RasGas
Al Thakhira	145,000	Peninsular LNG	Samsung	Sep-05	Bahamas	S	TZ Mk. III	4	Qatargas
Al Thumama	216,000	J5 Consortium	Hyundai	Apr-08	Japan	DRL	TZ Mk. III	4	Rasgas
Al Utouriya	215,000	J5	Hyundai	Sep-08	Panama	DRL	TZ Mk. III	4	RasGas
Al Utourma	215,000	J5	Hyundai	Sep-08	Panama	DRL	TZ Mk. III	4	Ras Gas III
Al Wajbah	137,350	J4 Consortium	Mitsubishi Nagasaki	Jun-97	Japan	S	Moss	5	Qatargas
Al Wakrah	135,360	J4 Consortium	Kawasaki Sakaide	Dec-98	Japan	S	Moss	5	Qatargas
Al Zhubarah	137,570	J4 Consortium	Mitsui Chiba	Dec-96	Japan	S	Moss	5	Qatargas
Alto Acrux	147,000	LNG Marine Transport	Mitsubishi	Mar-08	Bahamas	S	Moss	4	Various
Amali	148,000	Brunei-Shell	DSME	Jul-11	Brunei	DFDE	GT No. 96	4	Brunei LNG
AmanI	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
Asia Endeavour	160,000	Chevron	Samsung	Dec-14	Bahamas	DFDE	TZ Mk. III	4	Various
Asia Energy	160,000	Chevron	Samsung	Sept-14	Bahamas	DFDE	TZ Mk. III	4	Various
Asia Excellence	160,000	Chevron	Samsung	Sept-13	Bahamas	DFDE	TZ Mk. III	4	Various
Asia Vision	160,000	Chevron	Samsung	June-14	Bahamas	DFDE	TZ Mk. III	4	Various
Barcelona Knutsen	173,400	Knutsen	Daewoo	May-10	N.I.S.	DFDE	GT NO 96	4	Various
Bebatic	75,060	Brunei Shell Tankers	Atlantique	Oct-72	Brunei	S	TZ Mk. I	6	Brunei LNG
Beidou Star	172,000	MOL	Hudong	Oct-15	Hong Kong	DRL	GT NO. 96	4	Various
Berge Arzew	138,088	BW Gas	Daewoo	Jul-04	Norway	S	GT NO 96	4	Sonatrach
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
Bilbao Knutsen	138,000	Knutsen / Marpetrol	IZAR Sestao	Jan-04	Spain	S	GT NO 96	4	Atlantic LNG
Bilis	77,730	Brunei Shell Tankers	La Seyne	Mar-75	Brunei	S	GT NO 82	5	Brunei LNG
Bishu Maru	162,000	K Line-Transpacific	Kawasaki Sakaide	Dec-15	Panama	S	Moss	4	Australia-Japan
British Diamond	155,000	BP Shipping	Hyundai	Sep-08	IOM	DFDE	TZ Mk. II	4	Indonesia-Various
British Emerald	155,000	BP Shipping	Hyundai	Jun-07	UK	DFDE	TZ Mk. III	4	Tangguh LNG
British Innovator	138,200	BP Shipping	Samsung	Jul-03	Isle of Man	S	TZ Mk. III	4	Various

CARRIER FLEET

British Merchant	138,000	BP Shipping	Samsung	Apr-03	Isle of Man	S	TZ Mk. III	4	Various
British Ruby	155,000	BP Shipping	Hyundai	Jan-08	U.K.	DFDE	TZ Mk. III	4	Various
British Sapphire	155,000	BP Shipping	Hyundai	Sep-08	IOM	DFDE	TZ Mk. III	4	Tangguh
British Trader	138,000	BP Shipping	Samsung	Dec-02	Isle of Man	S	TZ Mk. III	4	Engas
Broog	135,466	J4 Consortium	Mitsui Chiba	May-98	Japan	S	Moss	5	Qatargas
Bu Samara	266,000	QGTC	Samsung	Dec-08	Qatar	DRL	TZ Mk. III	5	Qatargas
BW Suez Paris	162,400	BW Gas	Daewoo	May-09	N.I.S.	DFDE	GT NO 96	4	Yemen-Atlantic
BW Suez Brussels	162,400	BW Gas	Daewoo	May-09	N.I.S.	DFDE	GT NO 96	4	Yemen-Atlantic
Cadiz Knutsen	138,826	Knutsen / Marpetrol	IZAR Puerto Real	Jun-04	Spain	S	GT NO 96	4	Engas
Castillo de Santisteban	173,600	Elcano	STX	Aug-10	Malta	S	GT NO. 96		Various
Castillo de Villalba	138,000	Elcano	IZAR	Nov-03	Spain	S	GT NO 96	4	Sonatrach
Catalunya Spirit	138,000	Teekay LNG Partners	IZAR Sestao	Mar-03	Liberia	S	GT NO 96	4	Atlantic LNG
Celestine River	145,000	KLNG	Kawasaki	Dec-07	Bahamas	S	Moss		Various
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
Clean Energy	150,000	Pegasus Shiph'd	Hyundai	Mar-07	Marshall Is.	S	TZ Mk. III	4	Various
Clean Force	150,000	Seacrown Mariti	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
Cubal	160,400	Mitsui/NYK/Teekay	Samsung	Jan-12	Bahamas	DFDE	TZ Mk. III	4	Various
Cygnus Passage	145,400	Cygnus LNG	Mitsubishi	Feb-09	Panama	S	Moss	4	Various
Dapeng Moon	147,000	China Ships	Hudong	Jul-09	China	S	GT NO 96	4	Various
Dapeng Star	147,000	China Ships	Hudong	Nov-09	China	S	GT NO 96	4	Various
Dapeng Sun	147,000	China Ships	Hudong	Jul-07	China	S	GT NO 96	4	Woodside Energy
Disha	136,000	Petronet LNG Ltd.	Daewoo	Jan-04	Malta	S	GT NO 96	4	Qatargas
Doha	137,350	J4 Consortium	Mitsubishi Nagasaki	Jun-99	Japan	S	Moss	5	Qatargas
Duhail	210,100	ProNav	Daewoo	Jan-08	Germany	DRL	GT NO 96	4	Various
Dukhan	135,000	J4 Consortium	Mitsui Chiba	Oct-04	Japan	S	Moss	4	Qatargas
Dwiputra	127,385	Humpuss Consortium	Mitsubishi Nagasaki	Mar-94	Bahamas	S	Moss	4	Pertamina
Ebisu	147,547	Golar LNG	Kawasaki	Sep-08	Bahamas	S	Moss	4	Various
Ejnan	145,000	4J	Samsung	Jan-07	Bahamas	S	TZ Mk. III		RasGas
Ekaputra	136,400	Humpuss Consortium	Mitsubishi Nagasaki	Jan-90	Liberia	S	Moss	5	Pertamina
Energy Advance	145,000	Tokyo LNG Tankers	Kawasaki Sakaide	Mar-05	Japan	S	Moss	4	Darwin
Energy Atlantic	159,924	Alpha	STX Jinhae	Sep-15	Malta	DFDE	No. 96	4	Various
Energy Confidence	155,000	Tokyo LNG Tankers	Kawasaki	Apr-09	Panama	S	Moss	4	Various
Energy Frontier	147,600	Tokyo LNG Tankers	Kawasaki Sakaide	Sep-03	Japan	S	Moss	4	Darwin
Energy Horizon	177,000	Tokyo LNG Tankers	Kawasaki	Jul-11	Japan	S	Moss	4	Pluto LNG
Energy Navigator	147,000	Tokyo LNG Tankers	Kawasaki Sakaide	May-08	Japan	S	Moss	4	Various
Energy Progress	145,000	MOL	Kawasaki	Nov-06	Japan	S	Moss	4	Bayu Undan LNG
Esshu Maru	162,000	K Line-Transpacific	Kawasaki Sakaide	Dec-14	Panama	S	Moss	4	Australia-Japan
Excalibur	138,200	Exmar/ Excelerate	Daewoo	Oct-02	Belgium	S	GT NO 96	4	Various
Excel	138,106	Exmar/ MOL	Daewoo	Sep-03	Belgium	S	GT NO 96	4	Various
Excelerate	138,000	Exmar/Excelerate	Daewoo	Oct-06	Belgium	S	GT NO 96	4	Various
Excellence	138,000	GKFF Ltd.	Daewoo	May-05	Belgium	S	GT NO 96	4	Excelerate Energy
Excelsior	138,000	Exmar	Daewoo	Jan-05	Belgium	S	GT NO 96	4	Various
Exemplar	150,900	Excelerate	Daewoo	Jun-10	Belgium	S	GT NO 96	4	Various
Expedient	151,000	Excelerate	Daewoo	Nov-09	Belgium	S	GT NO 96	4	Various
Experience RV	174,000	Exmar/Excelerate	Daewoo	Jul-14	Marshall Is.	DFDE	GT NO 96		Various
Explorer	150,900	Exmar/Excelerate	Daewoo	Mar-08	Belgium	S	GT NO 96	4	Excelerate
Express	151,000	Exmar/Excelerate	Daewoo	May-09	Belgium	S	GT NO 96	4	Various
Exquisite	150,900	Excelerate	Daewoo	Sep-09	Belgium	S	GT NO. 96	4	Various
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
Galia 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 Salem	165,000	GasLog	Samsung	Apr-15	Liberia	TFDE	TZ Mk. III	4	various
GasLog Santiago	155,000	GasLog	Samsung	Mar-13	Liberia	TFDE	TZ Mk. III	4	Various
GasLog Saratoga	155,000	GasLog	Samsung	Dec-14	Bermuda	TFDE	TZ Mk. III	4	Various
Gaslog Savannah	155,000	GasLog	Samsung	May-10	Bermuda	DFDE	TZ Mk. III	4	Various
GasLog Seattle	155,000	GasLog	Samsung	Oct-13	Bermuda	TFDE	TZ Mk. III	4	Various
GasLog Shanghai	155,000	GasLog	Samsung	Jan-13	Liberia	TFDE	TZ Mk. III	4	Various
Gaslog Singapore	155,000	GasLog	Samsung	Jul-10	Bermuda	DFDE	TZ Mk. III	4	Various
Gaslog Skagen	155,000	GasLog	Samsung	Oct-13	Bermuda	DFDE	TZ Mk. III	4	Various
Gaslog Sydney	155,000	GasLog	Samsung	May-13	Bermuda	DFDE	TZ Mk. III	4	Various
GDF-Suez Global Energy	74,000	Gaz de France	Chantiers	Dec-06	France	DFDE	CS1	4	Sonatrach
GDF-Suez Cape Ann	145,000	Hoegh LNG/MOL	Samsung	May-10	Liberia	DFDE	TZ Mk. III	4	Various
GDF-Suez Neptune	145,000	Hoegh LNG/MOL	Samsung	Dec-09	Liberia	DFDE	TZ Mk. III	4	Various
GDF-Suez Point Fortin	154,200	LNG Japan	Imabari/Koyo	Feb-10	Panama	DFDE	TZ Mk. III	4	Various
Gemmata	138,100	Shell Shipping	Mitsubishi Nagasaki	Mar-04	Singapore	S	Moss	5	Shell
Ghasha	137,510	National Gas Shipping	Mitsui	Jun-95	Liberia	S	Moss	5	ADGAS
Golar Arctic	140,645	Golar LNG	Daewoo	Dec-03	Marshall Is.	S	GT NO 96	4	Shell Spot
Golar Bear	160,000	Golar	Samsung	Mar-14	Bermuda	DFDE	TZ Mk. III	4	Various
Golar Celsius	160,000	Golar LNG	Samsung	Sep-13	Bermuda	DFDE	TZ Mk. III	4	Various

Golar Crystal	160,000	Golar LNG	Samsung	Oct-13	Bermuda	DFDE	TZ Mk. III	4	Various
Golar Eskimo (FSRU)	160,000	Golar LNG	Samsung	Jan-15	Bermuda	DFDE	TZ Mk. III	4	Various
Golar Freeze	125,850	Golar LNG	HDW	Feb-77	UK	S	Moss	5	Various
Golar Glacier	162,000	Golar LNG	Hyundai	Sep-14	Marshall Is.	DFDE	TZ Mk. III	4	Various
Golar Grand	145,880	Golar LNG	Daewoo	2006	IoM		GT NO 96	4	Various
Golar Ice	160,000	Golar LNG	Samsung	Feb-15	Bermuda	DFDE	TZ Mk. III	4	Various
Golar Igloo (FSRU)	160,000	Golar LNG	Samsung	Oct-13	Bermuda	DFDE	TZ Mk. III	4	Various
Golar Kelvin	160,000	Golar LNG	Samsung	Jan-15	Bermuda	DFDE	TZ Mk. III	4	Various
Golar Maria	145,950	Golar LNG	Daewoo	2006	Marshall Is.		GT NO 96	4	Various
Golar Mazo	135,225	Golar LNG/CPP	Mitsubishi	Jan-00	Liberia	S	Moss	5	Pertamina
Golar Penguin	160,000	Golar LNG	Samsung	Mar-14	Marshall Is.	DFDE	TZ Mk. III	4	Various
Golar Seal	160,000	Golar LNG	Samsung	Aug-13	Bermuda	DFDE	TZ Mk. III	4	Various
Golar Singapore (FSRU)	160,000	Golar LNG	Samsung	June-15	Bermuda	DFDE	TZ Mk. III	4	Various
Golar Snow	160,000	Golar LNG	Samsung	Jan-15	Bermuda	DFDE	TZ Mk. III	4	various
Golar Tundra (FSRU)	160,000	Golar LNG	Samsung	Dec-15	Bermuda	DFDE	TZ Mk. III	4	Various
Golar Viking	140,000	Golar LNG	Hyundai	Jan-05	Marshall Is.	S	Moss	4	Various
Golar Winter	138,250	Golar LNG	Daewoo	Apr-04	Marshall Is.	S	GT NO 96	4	Petrobras
Grace Acacia	150,000	Algaet Shipping	Hyundai	Jan-07	Japan	S	TK MK III	4	Various
Grace Barleria	150,000	Swallowtail Ship	Hyundai	Oct-07	Japan	S	TZ Mk. III	4	Various
Grace Cosmos	150,000	AGH Shipping	Hyundai	Mar-08	Japan	S	TZ Mk. III	4	Various
Grace Dahlia	177,000	Tokyo Gas	Kawasaki	Oct-13	Japan	S	Moss	4	Various
Gracilis	138,830	Golar LNG	Hyundai	Jan-05	Marshall Is.	S	TZ Mk. III	4	Shell BG
Granatina	140,645	Shell Shipping	Daewoo	Dec-03	Singapore	S	GT NO 96	4	Shell
Grand Aniva	147,200	Sovcomflot/NYK	Mitsubishi	Jan-08	Japan	S	Moss	4	Various
Grand Elena	147,200	Sovcomflot/NYK	Mitsubishi	Oct-07	Japan	S	Moss	4	Various
Grand Mereya	147,200	Primorsk/MOL/K Line	Chiba	May-08	Japan	S	Moss	4	Sakhalin II
Hanjin Muscat	138,200	Hanjin Shipping	Hanjin	Jul-99	Panama	S	GT NO 96	4	Oman Gas
Hanjin Pyeong Taek	130,600	Hanjin Shipping	Hanjin	Sep-95	Panama	S	GT NO 96	4	Pertamina
Hanjin Ras Laffan	138,214	Hanjin Shipping	Hanjin	Jul-00	Panama	S	GT NO 96	4	QatarGas
Hanjin Sur	138,333	Hanjin Shipping	Hanjin	Jan-00	Panama	S	GT NO 96	4	Oman Gas
Hispania Spirit	140,500	Teekay LNG Partners	Daewoo	Sep-02	Spain	S	GT NO 96	4	Atlantic LNG
Hoegh Gallant FSRU	170,050	Hoegh LNG	Hoegh Hyundai	May-14	Marshall Is.	DFDE	TZ Mk. III	4	chartered
Hoegh Grace FSRU	170,050	Hoegh LNG	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
Lala Fatma N'Soumer	145,000	Algeria Nippon Gas	Kawasaki Sakaide	Dec-04	Japan	S	Moss	4	Sonatrach
Larbi Ben M'Hidi	129,750	SNTM-Hyproc	La Seyne	Jun-77	Algeria	S	GT NO 85	5	Sonatrach
Lijmilya	261,700	QGTC	Daewoo	Sep-08	Marshall Is.	DRL	GT NO. 96	5	Various
LNG Abuja	126,530	Bonny Gas Transport	GD Quincy	Sep-80	Bahamas	S	Moss	5	Nigeria LNG
LNG Adamawa	141,000	Bonny Gas Transport	Hyundai	Jun-05	Bermuda	S	Moss	4	Various
LNG Akwa Ibom	141,000	Bonny Gas Transport	Hyundai	Nov-04	Bermuda	S	Moss	4	Various
LNG Aquarius	126,300	MOL/LNG Japan	GD Quincy	Jun-77	Marshall Is.	S	Moss	5	Various
LNG Barka	153,000	NYK	Kawasaki	Jan-09	Bahamas	S	Moss	4	Various
LNG Bayelsa	137,500	Bonny Gas Transport	Hyundai	Feb-03	Bermuda	S	Moss	4	Nigeria LNG
LNG Benue	145,700	BW Gas	Daewoo	Mar-06	Bermuda	S	GT NO 96	4	Nigeria LNG
LNG Bonny	177,000	Bonny Gas Transport	Hyundai	Oct-15	Bermuda	DFDE	TZ Mk III	4	Nigeria LNG
LNG Borno	149,600	NYK Line	Samsung	Aug-07	Japan	S	TZ Mk. III	4	Nigeria LNG
LNG Capricorn	126,300	MOL/LNG Japan	GD Quincy	Jun-78	Marshall Is.	S	Moss	5	Pertamina
LNG Cross River	141,000	Bonny Gas Transport	Hyundai	Sep-05	Bermuda	S	Moss	4	Various
LNG Dream	145,000	Osaka Gas	Kawasaki	Sep-06	Japan	S	Moss	4	Woodside Energy
LNG Ebisu	147,500	MOL	Kawasaki	Sep-08	Bahamas	S	Moss	4	Various
LNG Edo	126,530	Bonny Gas Transport	GD Quincy	May-80	Bahamas	S	Moss	5	Nigeria LNG
LNG Enugu	145,000	BW Gas	Daewoo	Oct-05	Bermuda	S	GT NO 96	4	Nigeria LNG
LNG Fimina	175,000	Bonny Gas Transport	Samsung	Oct-15	Bermuda	DFDE	TZ Mk III	4	Nigeria LNG
LNG Flora	127,700	J3 Consortium	Kawasaki Sakaide	Mar-93	Japan	S	Moss	4	Pertamina
LNG Fukurokuju	165,000	MOL	Kawasaki	June-15	Japan	S	Moss	4	Various
LNG Gemini	126,300	MOL/LNG Japan	GD Quincy	Sep-78	Marshall Is.	S	Moss	5	Pertamina
LNG Imo	148,300	BW Gas	Daewoo	Jun-08	Bermuda	S	GT NO 96	4	Nigeria LNG
LNG Jamal	135,330	Osaka Gas/J3 Consortium	Mitsubishi Nagasaki	Oct-00	Japan	S	Moss	5	Oman Gas
LNG Jupiter	145,000	NYK Line	Kawasaki	Jul-09	Bahamas	S	Moss	4	Various
LNG Jurojin	155,300	MOL	MHI Nagasaki	Nov-15	Japan	S	KM	4	Various
LNG Kano	148,471	BW Gas	Daewoo	Jan-07	Bermuda	S	GT No. 96	4	NLNG
LNG Lagos	177,000	Bonny Gas	Hyundai	Oct-15	Bermuda	DFDE	TZ Mk III	4	Nigeria LNG
LNG Leo	126,400	MOL/LNG Japan	GD Quincy	Dec-78	Marshall Is.	S	Moss	5	Pertamina
LNG Lerici	65,000	Exmar	Italcantieri Sestri	Mar-98	Italy	S	GT NO 96	4	Sonatrach
LNG Libra	126,400	Hoegh LNG	GD Quincy	Apr-79	Marshall Is.	S	Moss	5	Various
LNG Lokoja	148,300	BW Gas	Daewoo	Dec-06	Bermuda	S	GT No. 96	4	Nigeria LNG
LNG 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

CARRIER FLEET

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
Madrid Spirit	138,000	Teekay LNG Partners	IZAR Puerto Real	Jan-05	Spain	S	GT No 96	4	Engas
Magellan Spirit	165,500	Teekay LNG Partners	Samsung	Sep-08	Denmark	DFDE	TZ Mk. III	4	Various
Malanje	160,400	Mitsui/NYK/Teekay	Samsung	Jul-11	Bahamas	DFDE	TZ Mk. III	4	Various
Maran Gas Alexandria	161,870	Maran	Hyundai Samho	Sep-15	Greece	DFDE	TZ Mk. III	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 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 Posidonia	161,870	Maran	Daewoo	May-14	Greece	DFDE	GT No 96	4	Various
Maran Gas Sparta	161,870	Maran	Hyundai Samho	April-15	Greece	DFDE	G TZ Mk. III	4	Various
Maran Gas Troy	155,900	Maran Gas	Daewoo	May-15	Greece	DFDE	GT No 96	4	various
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
Matthew	126,540	Suez LNG Shiping	Newport News	Jun-79	Bahamas	S	TZ Mk. I	6	Atlantic LNG
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
Methania	131,230	Distrigas	Boelwerf	Oct-78	Belgium	S	GT No 85	5	Sonatrach
Milaha Qatar	145,000	Milaha	Samsung	Apr-06	Denmark	S	TZ Mk. III	4	Qatar
Milaha Ras Laffan	138,270	Milaha	Samsung	Mar-04	Denmark	S	TZ Mk. III	4	RasGas II
Min Lu	147,000	China Ships	Hudong	Aug-09	China	S	GT No 96	4	Various
Min Rong	147,000	China LNG Ships	Hudong	Feb-09	Hong Kong	S	GT No 96	4	Australia-China
Mostefa Ben Boulaid	125,260	SNTM-Hyproc	La Ciotat	Aug-76	Algeria	S	TZ Mk. I	6	Sonatrach
Mourad Didouche	126,130	SNTM-Hyproc	Atlantique	Jul-80	Algeria	S	GT No 85	5	Sonatrach
Mozah	266,000	QGTC	Samsung	Aug-08	Qatar	DRL	TZ Mk III	5	Qatargas II
Mraweh	137,000	National Gas Shipping	Kvaerner-Masa	Jun-96	Liberia	S	Moss	4	ADGAS
Mubaraz	137,000	National Gas Shipping	Kvaerner-Masa	Jan-96	Liberia	S	Moss	4	Various
Muraq	210,100	J5-K Line	Daewoo	May-08	Marshall Is.	DRL	GT No 96	4	Qatar-Atl’c Basin
Murwab	210,100	J5 Consortium	Daewoo	May-08	Marshall Is.	DRL	GT No. 96	4	Qatargas
Muscat LNG	149,170	Oman Gas/MOL	Kawasaki Sakaide	Mar-04	Japan	S	Moss	4	Oman Gas
Neo Energy	149,700	Tsakos	Hyundai	Feb-07	Liberia	S	GTT Mk II	4	Various
Nizwah LNG	145,000	Oryx LNG Carriers	Kawasaki Sakaide	Dec-05	Japan	S	Moss	4	Oman Gas
Northwest Sanderling	127,525	Australia LNG	Mitsubishi Nagasaki	Jun-89	Australia	S	Moss	4	NWS
Northwest Sandpiper	127,500	Australia LNG	Mitsui Chiba	Feb-93	Australia	S	Moss	4	NWS
Northwest Seaeagle	127,450	Australia LNG	Mitsubishi Nagasaki	Nov-92	Bermuda	S	Moss	4	NWS
Northwest Shearwater	127,500	Australia LNG	Kawasaki Sakaide	Sep-91	Bermuda	S	Moss	4	NWS
Northwest Snipe	127,747	Australia LNG	Mitsui Chiba	Sep-90	Australia	S	Moss	4	NWS
Northwest Stormpetrel	127,600	Australia LNG	Mitsubishi Nagasaki	Dec-94	Australia	S	Moss	4	NWS
Northwest Swallow	127,708	J3 Consortium	Mitsui Chiba	Nov-89	Japan	S	Moss	4	NWS
Northwest Swan	138,000	Australia LNG	Daewoo	Mar-04	Australia	S	GT NO 96	4	NWS
Northwest Swift	127,590	J3 Consortium	Mitsubishi Nagasaki	Sep-89	Japan	S	Moss	4	NWS
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
Pacific Arcadia	147,200	NYK Line	MHI	Oct-14	Bahamas	S	KM		Various
Pacific Enlighten	145,000	LNG MT	Mitsubishi	Mar-09	Japan	S	Moss	4	Various
Pacific Eurus	137,000	LNG Marine Transport	Mitsubishi Nagasaki	Mar-06	Bahamas	S	Moss	4	Darwin
Pacific 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
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
Provalys	153,500	Gaz de France	Chantiers	Nov-06	France	DFDE	CS1	4	ELNG

Puteri Delima	130,400	MISC	Atlantique	Jan-95	Malaysia	S	GT NO 96	4	Petronas
Puteri Delima Satu	137,100	MISC	Mitsui Chiba	Apr-02	Malaysia	S	GT NO 96	4	Petronas
Puteri Firuz	130,400	MISC	Atlantique	May-97	Malaysia	S	GT NO 96	4	Petronas
Puteri Firuz Satu	137,100	MISC	Mitsubishi Nagasaki	Sep-04	Malaysia	S	GT NO 96	4	Petronas
Puteri Intan	130,400	MISC	Atlantique	Aug-94	Malaysia	S	GT NO 96	4	Petronas
Puteri Intan Satu	137,100	MISC	Mitsubishi Nagasaki	Dec-01	Malaysia	S	GT NO 96	4	Petronas
Puteri Mutiera Satu	137,100	MISC	Mitsui Chiba	Apr-05	Malaysia	S	GT NO 96	4	Petronas
Puteri Nilam	130,400	MISC	Atlantique	Jun-95	Malaysia	S	GT NO 96	4	Petronas
Puteri Nilam Satu	137,100	MISC	Mitsubishi Nagasaki	Sep-03	Malaysia	S	GT NO 96	4	Petronas
Puteri Zamrud	130,400	MISC	Atlantique	May-96	Malaysia	S	GT NO 96	4	Petronas
Puteri Zamrud Satu	137,100	MISC	Mitsui Chiba	Apr-87	Malaysia	S	GT NO 96	4	Atlantic LNG
Raahi	136,000	Petronet LNG Ltd	Daewoo	Dec-04	Malta	S	GT NO 96	4	Qatargas
Ramdane Abane	126,130	SNTM-Hyproc	Atlantique	Jul-81	Algeria	S	GT NO 85	5	Sonatrach
Rasheeda	266,000	QGTC	Samsung	Jun-10	Liberia	DRL	TZ Mk. III		Various
Ribera del Duero Knutsen	173,400	Knutsen	Daewoo	Nov-10	Nor-NIS	DFDE	GT NO. 96	4	Various
Salalah LNG	147,000	Oman Gas/MOL	Samsung	Dec-05	Japan	S	TZ Mk. III	4	Oman
SCF Polar	71,500	Sovcomflot	Kockums	Aug-69	Liberia	S	GT NO 82	6	Sonatrach
Seishu Maru	162,000	K Line-Transpacific	Kawasaki Sakaide	Jan-15	Panama	S	Moss	4	Australia-Japan
Seri Alam	138,000	MISC	Samsung	Oct-05	Malaysia	S	TZ Mk. III	4	Yemen LNG
Seri Amanah	145,000	MISC	Samsung	Mar-06	Malaysia	S	TZ Mk. III	4	Yemen LNG
Seri Anggun	145,000	MISC	Samsung	Nov-06	Malaysia	S	TZ Mk. III	4	Yemen LNG
Seri Angkasa	145,000	MISC	Samsung	Feb-07	Malaysia	S	TZ Mk. III	4	Petronas
Seri Ayu	145,000	MISC	Samsung	Oct-07	Malaysia	S	TZ Mk. III	4	Various
Seri Bakti	152,300	MISC	Mitsubishi	Mar-07	Malaysia	S	GT NO 96	4	Petronas
Seri Balhaf	152,000	MISC	Mitsubishi	Sep-08	Malaysia	S	GT NO 96	4	Various
Seri Balquis	152,000	MISC	Mitsubishi	Dec-08	Malaysia	S	GT NO 96	4	Various
Seri Begawan	152,300	MISC	Mitsubishi	Dec-07	Malaysia	S	GT NO 96	4	Various
Seri Bijaksana	152,300	MISC	Mitsubishi	Feb-08	Malaysia	S	GT NO 96	4	Petronas
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 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
Trinity Arrow	154,900	K Line	Imabari Shipbuilding	Mar-08	Panama	S	TZ Mk. III	4	Various
Umm Al Amad	210,100	J5	Daewoo	Aug-08	Marshall Is.	DRL	GT NO 96	4	Ras Gas III
Umm Al Ashtan	137,000	National Gas Shipping	Kvaerner- Masa	May-97	Liberia	S	Moss	4	ADGAS
Umm Bab	145,000	Kristen Navigation	Daewoo	Nov-05	Bermuda	S	GT NO 96	4	Qatargas
Umm Slaal	266,000	QGTC	Samsung	Nov-08	Qatar	DRL	TZ Mk. III	5	Qatargas
Valencia Knutsen	173,400	Knutsen	Daewoo	Sep-10	Nor-NIS	DFDE	GT NO. 96	4	Various
Velikiy Novgorod	170,200	SovComFlot	STX	Feb-14	Liberia	DFDE	GT No. 96	4	Various
Wakaba Maru	125,000	J3 Consortium	Mitsui Chiba	Apr-85	Japan	S	Moss	5	Pertamina
WilEnergy	125,500	Awilco LNG	Mitsubishi	Oct-83	NIS	S	Moss	5	Various
WilForce	156,000	Teekay LNG	Daewoo	Aug-13	NIS	DFDE	GT NO 96	4	Various
WilGas	125,500	Awilco LNG	Mitsubishi	Jul-84	NIS	S	Moss	5	Various
WilPower	125,500	Awilco LNG	Mitsubishi	Jul-84	NIS	S	Moss	5	Various
Woodside 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 Rogers	155,900	Maran Gas	DSME	Jul-13	Greece	DFDE	GT NO 96	4	Various
Yari LNG	159,983	TMSC Gas	Daewoo	Jun-14	Malta	TFDE	GT NO 96	4	Various
Yenisei River	155,000	Dynagas	Hyundai	Jul-13	Marshall Is.	DFDE	TZ Mk. III	4	Various
YK Sovereign	127,125	SK Shipping	Hyundai	Dec-94	Panama	S	Moss	4	Pertamina
Zarga	266,000	QGTC	Samsung	Dec-09	Liberia	DRL	TZ Mk. III	5	Qatar-Atlantic
Zekreet	135,420	J4 Consortium	Mitsui Chiba	Dec-98	Japan	S	Moss	5	Qatargas

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

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](mailto:John.McKay@lngjournal.com)

Country	Location (Project)	Owners	Start up	Storage	
				Tanks	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	2	320,000
	Dalian	PetroChina	2011	3	480,000
	Dongguan, Guangdong	Jovo Group	2013	2	160 000
	Fujian LNG (Xiuyu)	CNOOC, Fujian I&D Corp.	2008	2	640,000
	Guangdong	CNOOC,BP	2006	3	480,000
	Haikou, Hainan LNG	CNOOC	2014	3	480,000
	Ningbo, Zheijang	CNOOC, Zhejiang Energy	2012	3	480,000
	Qingdao, Shandong	Sinopec	2014	3	480,000
	Rudong	PetroChina	2011	2	320,000
	Shanghai	CNOOC, Shenergy Group	2009	3	495,000
	Shanghai, Mengtougou	Shanghai Gas	2008	3	120 000
	Tangshan, Hebei	PetroChina	2013	3	480,000
	Tianjin FSRU	CNOOC	2014	1	60,000
	Zhuhai, Gaolan	CNOOC	2013	3	480,000
Dominican Republic	Punta Caucedo	AES Andres	2003	1	160 000
France	Fos Tonkin	Elengy	1972	3	150,000
	Montoir-de-Bretagne	Elengy	1980	3	360,000
	Fos Cavaou	Engie, Total	2010	3	330,000
Greece	Revithoussa	DEPA	2000	2	130,000
India	Dabhol	GAIL, NTPC (Ratnagiri Gas & Power)	2009	3	480,000
	Dahej	Petronet LNG	2004	4	592,000
	Hazira	Shell India, Total	2005	2	320,000
	Kochi, Kerala	Petronet LNG	2013	2	320,000
Indonesia	Arun	Pertamina	2015	5	507,000
Italy	Panigaglia	Snam	1969	2	100,000
	Porto Levante (offshore GBS)	ExxonMobil, Qatar Petroleum, Edison Gas	2009	2	250,000
Japan	Negishi	Tokyo Gas	1969	14	1,180,000
	Sodegaura	Tokyo Gas	1973	35	2,660,000
	Ohgishima	Tokyo Gas	1998	4	850,000
	Higashi-Ohgishima	Tokyo Electric	1984	9	540,000
	Futtsu	Tokyo Electric	1985	10	1,110,000
	Yokkaichi LNG	Chubu Electric	1988	4	320,000
	Kawagoe	Chubu Electric	1997	6	840,000
	Yokkaichi Works	Toho Gas	1991	2	160,000
	Chita LNG Joint	Toho Gas, Chubu Electric	1978	4	300,000
	Chita LNG	Toho Gas, Chubu Electric	1983	7	640,000
	Chita - Midorihama	Toho Gas	2001	2	400,000
	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
	Mizushima	Nippon Oil, Chugoku Electric	2006	2	320,000
	Sakaide	Shikoku Electric, Cosmo Oil	2011	1	180,000
	Ishikari LNG	Hokkaido Gas, Tokyo Gas	2012	1	180,000
	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
Korea	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
Mexico	Tong-Yeong	Kogas	2002	17	2,620,000
	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
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

LNG Import Terminals (continued)

Country	Location (Project)	Owners	Start up	Tanks	Storage Capacity
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	GNF, Sonatrach, Tojeiro	2006	2	300,000
	El Musel, Gijón,	Enagas	2013	2	300,000
Taiwan	Yung-An	CPC	1990	6	690,000
	Tai-chung	CPC	2009	3	480,000
Thailand	Map Ta Phut	PTT LNG	2011	2	320,000
Turkey	Marmara Ereglisi	Botas	1994	3	255,000
	Izmir	EgeGaz	2006	2	280,000
USA	Everett	Suez LNG NA	1971	2	155,000
	Lake Charles	Shell, ETE	1982	4	425,000
	Elba Island	Kinder	2001	5	535,000
	Cove Point	Dominion	2003	5	530,000
	Freeport	Freeport LNG Development	2008	2	320,000
	Cameron	Sempra LNG	2009	3	480,000
	Golden Pass, TX	Qatar Petroleum, ExxonMobil	2010	5	775,000
	Pascagoula, MS	Gulf LNG, Kinder	2012	2	320,000
UK	Isle of Grain	National Grid	2005	8	1,000,000
	South Hook	ExxonMobil, Qatar Petroleum, Total	2009	5	775,000
	Dragon LNG, Milford Haven	Shell, Petronas	2009	2	310,000

LNG Import Terminal Projects

Country	Location/Project	Owners/Project Developers	Start up	Tanks	Storage Capacity
China	Swatuo, Guangdong	CNOOC	2016	2	320,000
	Yingkou, Liaoning	CNOOC	2016	2	320,000
	Qidong, Jiangsu	Shell-Guanghai	studies		
	Yuedong LNG, Jieyang, Guangdong	CNOOC	2016	2	320,000
Finland	Pori	Gasum Skangass	2016	1	30,000
	Tornio	Gasum, Skangass	2018	1	30,000
France	Dunkirk LNG	LNG EDF, Fluxys, Total	2016	3	570,000
India	Ennore	Indian Oil Corp	2016	2	320,000
	Mundra	Gujarat State Petroleum, Adani Group	2016	2	320,000
	FSRU Andhra Pradesh	Engie, Andhra Pradesh Gas	2016	1	135,000
	Pipovav LNG (FSRU), Gujarat	Swan Energy	2016	2	320,000
Indonesia	Labuhan Maringgai	Perusahaan Gas Negara	2016	1	135,000
Japan	Soma, Fukushima	Japan Petroleum	2017	1	230,000
Malaysia	Lahad Datu LNG, Sabah	Petronas	2016	studies	
Philippines	Pagbilao LNG	Energy World Corp.	2016	1	130,000
UAE (FSRU)	Fujairah	Mubadala	2016	1	135,000
UK	Port Meridian, Barrow-in-Furness	Port Meridian Energy Ltd.	2016	1	150,000
Uruguay FSRU	Montevideo	Gas Sayago, Mitsui Osk Lines	2017	1	230,000

LNG FSRU Import Facilities

Country	Location (Project)	Owners	Start up
Argentina	Bahia Blanca GasPort	Excelsior/YPF Repsol	2008
	Escobar GasPort	Excelsior/Enarsa	2011
Brazil	Pecem, FSRU	Petrobras	2009
	Guanabara Bay FSRU	Petrobras	2009
	Salvador, Bahia FSRU	Petrobras	2013
Dubai	Jebel Ali Port	DSA of UAE	2010
Egypt	Ain Sokhna, Suez	EGAS, Hoegh	2015
	Ain Sokhna, Suez	EGAS, Golar	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	Klaipėdos Nafta Hoegh LNG	2014
Malaysia	Malacca FSRU	Petronas	2012
Pakistan	Port Qasim	Excelsior, Engro Corp	2015
UK	Teesside GasPort	Excelsior	2007

LNG Export Projects

Country	Location/Project	Project Developers	Planned Start Up	Number of Trains	Capacity In MTPA
AUSTRALIA	Browse LNG	Woodside, BHP, BP Chevron, Shell, Mitsubishi, Mitsui	2018+	2	10.0
	Ichthys LNG	INPEX, Total	2017	2	8.4
	Prelude FLNG	Shell, Inpex, Kogas CPC	2017	1	3.5
	Sunrise LNG	Woodside, Osaka Gas, ConocoPhillips, Shell	2020+	1	3.5
	Wheatstone LNG	Chevron, Apache, Shell , Kuwait FPEC	2017	2	9.0
CANADA	Aurora LNG BC	CNOOC, Inpex Corp. and JGC Corp.	2020	4	24.0
	Bear Head LNG, Nova Scotia	LNG Ltd.	2020	4	8.0
	Canaport LNG, New Brunswick	Repsol Irving Oil	2020	studies	
	Cedar 1, 2, 3, Kitimat area	LNG Export Ltd (Haisla)	2020	studies	
	Douglas Channel LNG Bish Cove	Exmar, EDF, ItaGas, Idemitsu	2018	1	1.0
	GNL Quebec, Saquenay	Freestone Capital and Breyer Capital	2020	4	10.0
	Goldboro LNG, Nova Scotia	Pieridae Energy	2020	2	10.0
	Grassy Point LNG	Woodside Petroleum	2020	studies	
	Kitimat LNG, BC	Woodside, Chevron	2020	2	10.0
	LNG Canada, BC	Shell, Mitsubishi, Kogas, PetroChina	2020	2	12.0
	Melford LNG project, Nova Scotia	H-Energy Hiranandani Group	Studies		
	Pacific Northwest LNG, BC	Petronas, Japex, Sinopec, Indian Oil, Brunei Petroleum	2019	2	12.0
	Shell Prince Rupert LNG, BC	Shell	2020	3	21.0
	Steelhead LNG, Bamfield	Steelhead LNG Corp	2020	2	12.00
	Vancouver Tilbury	WesPac Midstream	2020	1	3.25
EQ.GUINEA	Equatorial Guinea Fortuna FLNG	Ophir and Golar LNG	2019	1	2.0
INDONESIA	Abadi FLNG	Inpex, Shell	2019	2	7.5
	Sengkang LNG	Energy World Corp.	2016	4	2.0
MALAYSIA	Bintulu Train 9	Petronas	2016	1	3.6
	Kanowit FLNG (Sarawak)	Petronas	2016	1	1.2
	Rotan FLNG (Sabah)	Petronas	2017	1	1.5
MOZAMBIQUE	Area 1 Onshore	Anadarko Petroleum and partners	2018	2	10
	Area 4 Onshore	Eni and partners	2020	2	10
	Area 4 FLNG	Eni and partners	2019	1	2.5
NIGERIA	NLNG Train 7	NNPC, Shell, BP, Total	2020+	1	8.4
	Olokola LNG	NNPC, Chevron, Shell	2020+	4	20.0
PAPUA NEW GUINEA	Elk-Antelope LNG	Total, InterOil, Oil Search, Petromin	Studies		
RUSSIA	Shtokman LNG Murmansk	Gazprom, Statoil, Total	2019	4	20.0
	Yamal LNG Siberia	Novatek, Gazprom, Total	2018	3	16.5
	Sakhalin II expansion	Gazprom, Shell, Mitsui, Mitsubishi	2017+	studies	
	Vladisvostok LNG	Gazprom, Itochu, various	2018	2	10.0
USA	Alaska LNG Nikiski	ExxonMobil, BP, ConocoPhillips, Alaska State	2020	3	20.0
	Annova LNG, Brownsville	Exelon Corp.	2020	6	6.0
	Cameron LNG, Louisiana	Sempra	2018	5	24.92
	Corpus Christi Liquefaction, Texas	Cheniere	2019	5	22.5
	Cove Point LNG, Maryland	Dominion	2018	1	5.25
	Delfin LNG Louisiana	Delfin, Hoegh	2020	3	9.0
	Freeport LNG, Texas	Freeport LNG	2018	4	20.4
	Golden Pass, Texas	Qatar Petroleum, ExxonMobil	2020	3	15.6
	Jordan Cove Energy	Veresen Inc.	2020	2	6.8
	Lake Charles, Louisiana	Shell, ETE	2019	3	15.0
	Live Oak LNG	Parallax	2020	1	5.0
	Louisiana LNG Energy (Mississippi R.)	Parallax, Cheniere	2020	3	6.0
	Magnolia LNG	Louisiana LNG Ltd.	2019	4	8.0
	Oregon LNG	Leucadia Corp.	2020	2	9.6
	Port Arthur LNG	Sempra	2020	2	10.0
	Rio Grande LNG	NextDecade	2020	6	27.0
	Sabine Pass LNG, Louisiana	Cheniere	2016-19	5	22.5
	Southern LNG	Kinder Morgan	2019	4	2.0
	Texas LNG Brownsville	Chandra, Meyer, Samsung, others	2020	2	4.0
	VG LNG (Cameron Parish)	Venture Global	2019	10	10.0
	VG LNG (Plaquemines)	Venture Global	2019	10	20

LNG Exporters

Country	Location/Project	Shareholders	Start up	Liquefaction		Storage	
				Trains	capacity (nominal) mtpa	No. of tanks	Total capacity m ³
ABU DHABI (UAE)	Das Island (Adgas)	ADNOC, Mitsui, BP, Total	1977 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 Gladstone LNG Gorgon LNG Pluto LNG QCLNG	ConocoPhillips, Origin Energy, Sinopec	2016	2	7.5	2	320,000
		Santos, Petronas, Total, Kogas	2015	2	7.8	2	280,000
		Chevron, Shell, ExxonMobil	2016	3	15.6	2	360,000
		Woodside, Tokyo Gas, Kansei	2012	1	4.8	2	240,000
		Shell, CNOOC	2014	2	8.0	2	280,000
BRUNEI	Lumut	Brunei/Shell/Mitsubishi/Total	1972-74	5	7.2	3	176,000
EGYPT	Damietta	Union Fenosa, EGPC, EGAS	2004	1	5.0	2	300,000
	Idku	EGPC, EGAS, Shell, Engie, 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
LIBYA	Marsa el Brega	Sirte Oil (NOC/Shell upgrading)	1970	2	(2.5)	2	96,000
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
NIGERIA	Bonny Island	NNPC, Shell, Total, Eni	1999	2	6.4	2	168,400
		Nigeria LNG (formed by above)	2002	1	3.2	1	84,200
		Nigeria LNG	2006	2	8.2		
		Nigeria LNG	2008	1	4.1	1	84,200
NORWAY	Snøhvit/Melkoya Island	Statoil, Total, GDF-Suez, Petoro	2007	1	4.2	2	280,000
OMAN	Oman LNG	Oman Govt., Shell, Total, Korea LNG	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-T1	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	6	840,000
	RasGas II- T4	QP, ExxonMobil	2005	1	4.7		
	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
TRINIDAD & TOBAGO	Point Fortin Train 1	BP, Shell, Suez, 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	1	4.5	5	800,000
	Kenai - Alaska	ConocoPhillips, Marathon Oil	1969	2	1.3	3	108,000
YEMEN	Bal-Haf	Yemen LNG, Total, Yemen Gas, Hunt Oil, SK Group, Hyundai	2009	2	6.7	2	320,000

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