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BP outlook points to strong global LNG market growth in volumes and trading

UK major believes there is a risk that second wave of supply growth may be slow to materialize

Global liquefied natural gas supplies are forecast to grow strongly over the next few years, led by projects coming on stream in Australia and the US, with trading in the sector expanding seven times faster than pipeline gas trade.

After a temporary lull while this initial wave of LNG supplies is absorbed, growth is assumed to resume at a more moderate pace, according to the 2017 BP Energy Outlook.

There is a risk that this second wave of LNG supply growth is slow to materialize, causing a temporary period of tightness within the supply chain.

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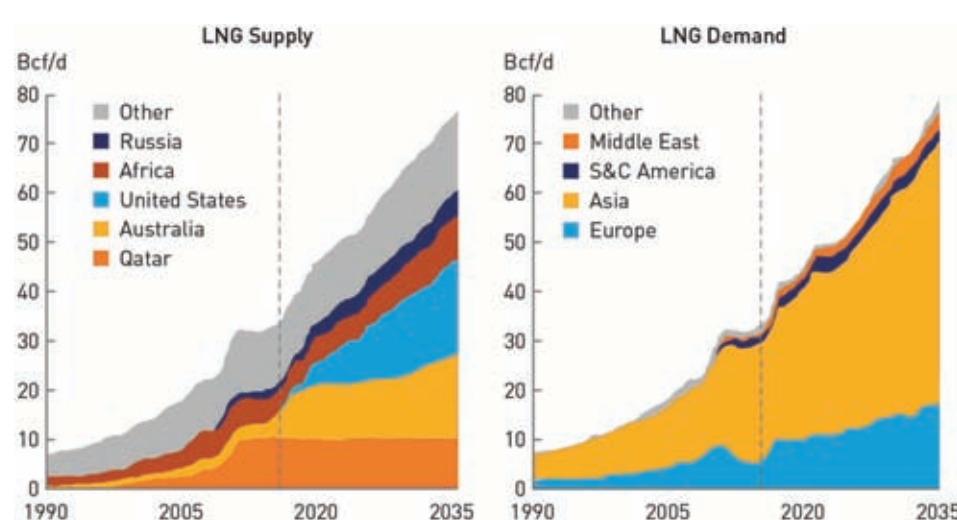
"Asia remains the largest destination for LNG. China, India and other Asian countries all increase their demand, helping gas to grow faster than either oil or coal in each of these economies," said BP.

Europe also makes increasing recourse to LNG to help meet the growing gap caused by declines in its domestic production.

"The LNG sector will grow seven times faster than pipeline gas trading and by 2035 it will account for around half of all globally traded gas, up from the current 32 percent," the BP report said.

"The significance of the growing importance of LNG-based trade is that, unlike pipeline gas, LNG cargoes can be redirected to different parts of the world in response to regional fluctuations in demand and supply," BP added.

"As a result, gas markets are likely to become increasingly integrated across the world. In particular, if prices move further apart than is warranted by transportation costs, there will be an incentive for LNG supplies to be redirected until prices move back into line," the report said.



BP vision of LNG supply and demand by regions until 2035

The UK major said natural gas distribution would grow more quickly than oil and coal, led by US shale gas and the rapid expansion of LNG is likely to lead to a globally integrated gas market, anchored by US gas prices.

Oil demand is forecast to grow throughout the BP Outlook period to 2035, but the pace of demand slows with non-combusted use replacing transport as the main source of demand growth.

"In our base case, carbon emissions from energy grow at less than a third of the rate of the past 20 years, reflecting gains in energy efficiency and the changing fuel mix," the report said.

Emissions

"But emissions continue to rise, highlighting the need for further action," it added.

BP Group Chief Executive Bob Dudley said in an overview that the global energy landscape was changing and traditional centres of demand were being overtaken by fast-growing emerging markets.

"The energy mix is shifting, driven by technological improvements and environmental concerns. More than ever, our industry needs to adapt to meet those

changing energy needs." "In the near term, much of our focus will remain on the continuing adjustment of the oil market. Considerable progress has been made but there is still a long way to go," added Dudley.

"Oil inventories are at record-high levels and the impact on supply of the significant cutbacks in investment spending on new energy projects over the past two years has not yet been fully felt.

"But our response to those near-term challenges has to be informed by our understanding of the longer-term energy transition that is taking place to ensure we are able to continue to meet the energy needs of a changing world," the CEO stated.

"That is the value of the Energy Outlook: to shine a light on the key trends and forces that are likely to shape global energy markets over the next 20 years," said Dudley.

"Rapid improvements in the competitiveness of renewable energy mean that increases in renewables, together with nuclear and hydro energy, provide around half of the increase in global energy out to 2035.

"Natural gas is expected to grow faster, helped by the rapid growth of LNG,

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increasing the accessibility of gas across the globe,” the BP CEO said.

US liquefaction

US LNG exports are likely to be more diversified, providing the marginal source of gas for markets in Europe, Asia and South and Central America.

“As such, US gas prices are likely to play a key role in anchoring gas prices in a globally integrated market,” BP said.

“The development of a deep and competitive LNG market is likely to cause long-term gas contracts to be increasingly indexed to spot prices,” the UK company added.

Among leading nations, China is the world's largest consumer of energy and has been the most important source of growth for global energy over the past 20 years.

But as China adjusts to a more sustainable pattern of growth, its energy needs are likely to change.

China's demand for energy is projected to grow by less than 2 percent per annum over the Outlook, compared with over 6 percent per annum over the past 20 years.

Slowdown

“Part of this slowing reflects an easing in economic growth. Annual GDP growth averages close to 5 percent per annum over the Outlook, around half the average pace of growth since 2000.

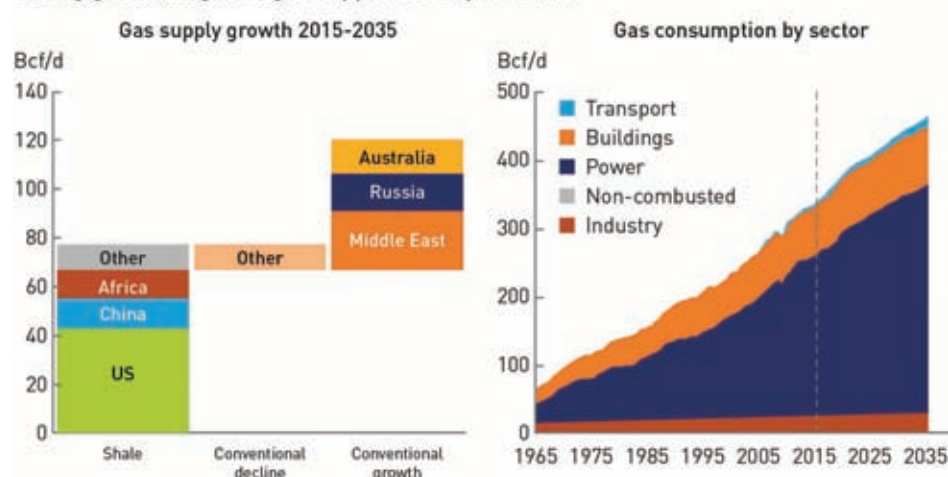
“The slowing also reflects continuing sharp declines in energy intensity as economic activity within China gradually shifts away from energy-intensive industrial output towards more energy-light consumer and services activity, and policies drive further improvements in energy efficiency,” said BP.

China's energy intensity will decline by 3 percent over the period, significantly quicker than the projected global average, and converging with US levels by 2035.

The outlook for Chinese energy demand has been revised down significantly over the past three years. The current outlook for China's energy consumption in 2035 is 8 percent (400 million tonnes of oil equivalent) below our view in 2014.

“Around half of that difference reflects lower-than-expected outturns for energy consumption in recent years, as economic growth has slowed more quickly than expected and energy intensity has fallen more sharply.

Strong growth in global gas supplies led by US Shale



Natural gas supply and consumption forecasts by sectors

“The remainder reflects weaker prospects for economic growth, particularly in the second half of the Outlook.

Asia effect

“Despite this large downgrade to Chinese consumption, the expected level of energy demand in emerging Asia as a whole in 2035 is broadly unchanged.

“Upward revisions to energy consumption in India and other emerging Asia economies offset the reductions to Chinese demand,” BP stated.

“These upward revisions to Asian energy demand outside of China reflect a more upbeat view of economic growth.

“This partly reflects the expectation that as China's economy matures and rebalances, some industries will migrate to cheaper, lower-income Asian economies, such as India, Indonesia or Vietnam,” it added.

BP said natural gas was projected to grow at more than twice the rate of either oil or coal, with its share within primary energy increasing throughout the Outlook.

Growth in gas

“The strength of natural gas demand partly reflects gas gaining share from coal helped by government policies encouraging a shift away from coal and supporting growth in gas,” it said.

“The ‘faster transition’ cases illustrate how tighter climate policies may cause the growth of gas to be slower than anticipated. It is also possible that the growth of natural gas may be threatened if there is less government support encouraging a switch from coal into gas.

“To explore this possibility, we created an alternative ‘slower gas’ case where the demand for coal is more resilient than in

the base case, with slower growth in gas consumption.

“The growth of natural gas is a third slower (1.1 percent per annum versus 1.6 percent per annum), such that the share of gas within primary energy falls over the period.

“The share of coal continues to fall in this alternative case, but less rapidly than in the base case,” BP said.

“This alternative case assumes that climate and environmental policies tighten by less than expected in the base case.

Policies

“In particular, the set of regulatory policies aimed at promoting a shift away from coal and towards natural gas are considerably weaker and there is effectively no support from carbon pricing,” the report added.

“This is equivalent to assuming an increase in the price of gas relative to coal of around 50 percent compared to the base case,” the UK report said.

In China, which accounts for one-third of the global reduction in gas demand relative to the base case, the share of coal within total energy still declines, but at a slightly slower rate.

“The impact on Chinese gas consumption is more marked, with the share of gas in China's energy mix increasing only slightly, rather than almost doubling as in the base case.

“The ‘slower gas’ case, together with the faster transition cases, demonstrates that the strength of natural gas demand envisaged in the base case could be challenged by alternative assumptions about the strength of future climate and environmental policies, with both stronger and weaker policy assumptions posing potential threats,” stated BP. ■



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Australian LNG exports set to start final surge with Ichthys and Wheatstone plants

Two onshore plants and the deployment Prelude FLNG will take output close to Qatar's

Australia has raised its forecast for liquefied natural gas exports for fiscal 2018 by 35 percent a year for the next two years. The total is set to rise to 67.3 million tonnes as three additional LNG projects are expected to commence production by mid-2018.

The three projects Ichthys LNG, Wheatstone LNG and Prelude FLNG would bring Australia's export capacity to around 70MT.

Timing

"However, some uncertainty surrounds the timing of Shell's Prelude project in the Browse Basin where start up could be complicated by the cyclone season, which runs from November to April," said the latest quarterly resources and energy report from the Australian Department of Industry.

Australia's LNG export volumes increased 50 percent year-on-year in the September 2016 quarter to around 12MT.

Three LNG plants commenced production over the previous 12 months, Gorgon, Australia Pacific LNG and Gladstone LNG.

Australian exporters have increased their share of imports in the key markets of Japan, South Korea and China.

Transformation

The global LNG market is going through a period of significant transformation, with a major expansion in liquefaction capacity currently underway.

Global liquefaction capacity is forecast to

in 2017, and by 8.8 per cent in 2018 to 343 million tonnes. The majority of new capacity will be added in Australia and the US.

All five LNG projects currently under construction in the US are scheduled to add to capacity by the end of 2018, although only the first of three Trains at the Freeport LNG project will reach completion.

The coming of on stream of LNG projects in a number of other countries will also contribute to growth in global liquefaction capacity over the next two years, including floating production hulls.

"In the September quarter, Australia accounted for 57 percent of China's imports, up from 36 percent a year earlier," the report noted.

"The value of Australia's LNG exports is forecast to increase by 50 percent a year to \$37 billion in 2017-2018, supported by higher LNG prices and export volumes. LNG contract prices, under which most Australian LNG is sold, are forecast to increase in line with oil prices," it added.

Share

"Australian producers are expected to capture an increasing share of imports into major markets in Northeast Asia as long-term LNG import contracts commence.

"The forecast for export earnings has been revised up, reflecting an improved outlook for oil prices," it added.

The price of Australian LNG delivered to major markets in North East Asia increased between July and October of

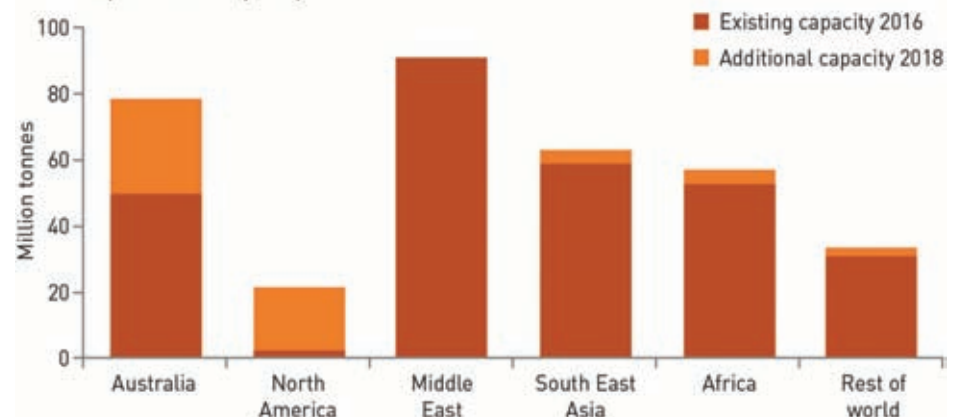
2016. The price of LNG into Japan,

Australia's largest market and the world's largest importer, averaged US\$7.05 a gigajoule October, up from US\$6.13 in July.

"The uptick in prices reflects the effect of the oil price rally during the first half of 2016.

Most Australian LNG delivered into Asia is sold under contracts linked to the Japanese Crude Cocktail oil price by a time lag of three to four months," it explained.

World liquefaction capacity



Sources: Nexant World Gas Model (2016)

Australia output gathers pace again through period to 2018

The JCC oil price remained broadly stable in August and September at around US\$45 a barrel, and its lagged effect on LNG contract prices is expected to be seen in coming months.

"LNG contract prices are then expected to rise over 2017 and 2018, in line with the forecast for a recovery in oil prices to over US\$60 a barrel," the Australians said.

Divergence

The implications of a potential divergence between contract and spot LNG prices remain to be seen.

"One scenario is that buyers reduce LNG purchases to take-or-pay levels and seek to buy larger volumes on the spot market.

"A divergence between spot and contract prices would also encourage buyers' efforts to renegotiate pricing mechanisms in LNG contracts. India's Petronet has reportedly renewed efforts to renegotiate the pricing formula for supplies from Australia's Gorgon LNG project," the report added.

In the Western market, Australia's largest gas producing area, production is expected to rise as the Gorgon project ramps up and the Wheatstone and Prelude projects come online.

In the Eastern market, increased CSG production to support exports from recently completed LNG projects will contribute to growing gas production. Rising production in the small Northern market will be driven by the completion of the Ichthys project.

"However, some uncertainty surrounds the timing of Shell's Prelude project in the Browse Basin, where start up could

be complicated by the cyclone season - which runs from November to April," the report added.

North Asia

Increased exports to Japan, South Korea and China are expected to drive the rise in Australia's export volumes.

"Australian producers are expected to capture an increasing share of these countries' imports with the commencement of a number of long-term contracts over the outlook period [over 2017-2018]," the department said.

Another LNG report was issued by the independent energy consultancy, EnergyQuest.

"Notwithstanding the lower oil price environment present through much of last year, EnergyQuest estimates the total value of Australian LNG exports as A\$17.9Bln in 2016," the report said.

Oil prices to which LNG prices are linked are now around 25 percent higher than the 2016 average, reflecting recent production decisions by the Organization for Petroleum Exporting Countries.

Export values

"If current oil prices are maintained, EnergyQuest estimates that the value of Australian LNG exports will double to around A\$36Bln in 2017," it added.

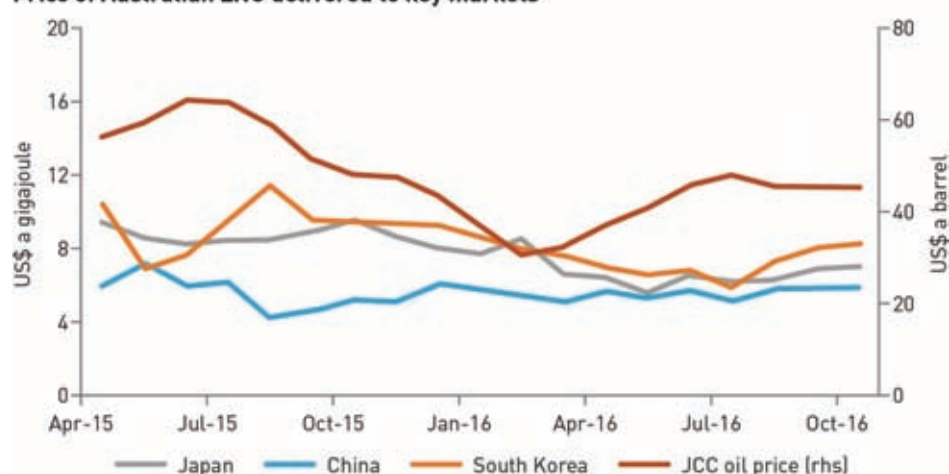
"The growth of LNG exports is a massive benefit to the Australian economy," explained EnergyQuest Chief Executive Graeme Bethune.

"Australia's newest LNG hub - the three new plants around Gladstone - not surprisingly saw Queensland LNG exports nearly triple to 17.5MT in 2016," he added.

LNG contract prices are expected to rise over 2017 and 2018, in line with the forecast for a recovery in oil prices to over US\$60 a barrel

rise by 11 per cent

Price of Australian LNG delivered to key markets



Prices of Australian cargoes shipped to its main markets

West coast exports were down slightly at 19.3MT for the end-of-year period.

“Most Australian LNG exports continued to go to established customers with long-term contracts during the year,” added the EnergyQuest report.

“Japan remains the largest customer for Australian LNG, taking 48 percent of 2016 cargoes,” it said.

China cargoes

“China is now the second-biggest customer, taking 30 percent of cargoes (60 percent of cargoes from Queensland),”

said EnergyQuest. South Korea is an emerging buyer (53 cargoes) from Australia as is India, which purchased 16 cargoes.

The government’s report continued by saying Australian gas production will increase from 81 Bcm in 2015-2016 to 128 Bcm in 2017-2018, an increase of 58 percent.

Conventional gas production is forecast to rise by 34 Bcm to 91 Bcm in 2017-2018.

CSG production is forecast to increase by 13 Bcm to 38 Bcm.

The government report said that on the regional front, Chinese LNG imports are forecast to increase by 34 percent a year to 43MT in 2018 as the nation aims to increase its share of gas in its energy mix from 5 percent to 10 percent by 2020 and pipeline deliveries fall short of expectations.

“LNG will play an important role in servicing rising gas demand, with China having agreed to contracts requiring large volumes of LNG imports over the next few years,” it said.

“The deferral of Line D, the fourth and final pipeline in the China-Central Asia gas pipeline network, should support LNG imports,” stated the Australian report.

Growth

The pipeline was expected to have a total capacity of 30 Bcm per annum, equivalent to around half of China’s total gas imports in 2015.

“Both domestic production and pipeline imports are expected to grow alongside LNG imports,” added the report.

Import growth in other emerging Asian economies is also expected to

support demand growth for LNG. Expectations of persistent low spot prices continue to encourage countries in Asia to expand LNG import infrastructure.

“Import growth will be facilitated by floating storage regasification unit technology, which allows small volumes of LNG to be received economically by less mature import markets,” said the Australians.

Europe

Europe is expected to be another key source of demand growth to 2018. LNG imports are forecast to increase by 21 percent a year, to reach 65MT in 2018.

Production in Europe is expected to fall, partly as a result of lower production at Europe’s largest natural gas field - Groningen in the Netherlands.

In September 2016, the Dutch parliament approved a government proposal to lower the annual production cap at the Groningen gas field from 27 Bcm to 24 Bcm from October 2016.

The policy is aimed at reducing the frequency and intensity of earthquakes associated with production from the field.



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For the Record

ALASKA Gasline Development Corp. (AGDC) reached agreement with oil majors ExxonMobil, BP and ConocoPhillips to take over technical and regulatory responsibility for the Alaska LNG project. AGDC is now in charge of all activities related to the proposed Alaskan liquefaction and export plant and an 800-mile pipeline venture to access North Slope natural gas supplies. AGDC, which represents the State of Alaska's energy interest, is an independent public corporation and will now have the final say on the proposals to export at least 20 million tonnes per annum of LNG. It said the agreement with the three energy companies "will enhance AGDC's ability to progress" the LNG export project. Under a pre-front-end engineering and design joint venture agreement, the parties completed all of their initial commitments, including reports for the Federal Energy Regulatory Commission environmental permit process. "The parties have spent more than \$500M on an Alaska LNG project," said AGDC. "AGDC will now assume the responsibility for the technical and regulatory activities associated with the project," it added. "This arrangement promotes the seamless continuation of the regulatory, commercial and optimization efforts. AGDC plans on completing the FERC pre-filing process, building upon the draft environmental and socioeconomic resource reports prepared by the parties during pre-FEED," it explained. The Alaska project's facilities include a liquefaction facility to be located in the Nikiski area on the Kenai Peninsula and the pipeline as well as eight compression stations and at least five take-off points for in-state gas delivery. There will also be a gas treatment plant located on the North Slope and transmission lines to transport gas from Prudhoe Bay and Point Thomson to the gas treatment plant.

AIR PRODUCTS, the leading US and global LNG equipment maker, has made a takeover approach to Yingde Gases of China to gain a prominent role in the expanding Chinese natural gas and equipment market after completing its

own restructuring. Yingde Gases is a leading supplier of industrial gases and has established manufacturing sites in many regions of China and with main offices in Hong Kong and Shanghai. Air Products has been the main supplier of liquefaction equipment to plants around the world during the industry expansion and is the technology provider for US plants such as the Cameron project in Louisiana being developed by Semptra Energy. "Air Products has submitted a letter to Yingde Gases setting forth a preliminary, non-binding indication of interest to acquire all of the outstanding shares of Yingde, subject to the satisfaction of certain conditions," the US company said. "No agreement between Air Products and Yingde has been reached," added Air Products, based in Lehigh Valley, Pennsylvania. "There cannot be any assurance that such an agreement will be reached or, if such an agreement is reached, that a transaction will be completed," it said. "Air Products does not intend to comment further at this time," the company added. Air Products specializes in providing LNG heat exchangers, on-site gas generation and other key equipment. The company has offloaded its Versum Materials unit and its Performance Materials Division as part of a major restructuring. The US company is concentrating more on its LNG business and in September 2016 marked the roll-out of the first completed LNG heat exchanger manufactured at its new production facility in Manatee County, Florida. Air Products had sales for all of fiscal 2016 of \$9.5 billion, down 4 percent from the \$9.9Bln for fiscal 2015. The Chinese takeover target Yingde has a business based on air separation units and processes and makes and supplies a range of gases. Yingde was only established in October 2001. After 15 years of development, it became the largest gas services company in China. Yingde was listed on the main board of the Hong Kong Stock Exchange in October 2009.

BW MARITIME, the Singapore-based LNG shipping and project company, has held a naming ceremony for its second floating storage and regasification unit (FSRU), the "BW Integrity" that will become the second import facility deployed in Pakistan. The naming ceremony was held at the South Korean shipyard of Samsung Heavy Industries at Geoje Island. The FSRU will serve as Pakistan's second FSRU and will be

berthed at Port Qasim, west of Karachi, under a deal BW signed with Pakistan GasPort Ltd in August 2016. With capacity of 170,000 cubic metres the vessel will have peak regasification capability of 750 million standard cubic feet per day. The company's first FSRU "BW Singapore" is currently based under a five-year charter contract providing LNG regasification and storage services at the Gulf of Suez Port of Ain Sokhna in Egypt. BW, whose shares are also listed in Norway where it has business roots, has a fleet of more than 20 LNG carriers. The BW Group is the successor company of the original shipping lines Bergesen and World-Wide Shipping and has about 140 other vessels involved in energy and dry-cargo shipping as well as providing offshore platforms. BW also has a shipping joint venture with Pavilion energy, the Singapore operator owned by the island state's wealth fund, Temasek. "The FSRU represents BW's commitment to provide customers with high quality LNG shipping and regasification solutions," said Carsten Mortensen, BW Group Chief Executive. "We look forward to a trusted, solid and strong working relationship with our friends and partners in Pakistan, as we deploy this vessel for the second Pakistan LNG terminal at Port Qasim," added Mortensen. Iqbal Z. Ahmed, Chairman of Pakistan GasPort, said he was delighted to celebrate the vessel naming in South Korea. "The 'BW Integrity' is a vital and essential part of our plan to reduce Pakistan's gas deficit, provide fuel for 3,600 megawatts of new power-generation capacity and yield an estimated US\$1.5 billion in annual foreign-exchange savings, while visibly boosting the country's economic growth," said Ahmed.

DRESSER-RAND, part of the German Siemens Group, said production was successfully ramped up at a small-scale natural gas liquefaction facility supplied to a US operator making LNG for fuel in the Marcellus Shale region of Pennsylvania. The modular, portable liquefaction technology called "LNGo" enables production of LNG at up to 6,000 gallons per day and can be installed in a short period of time to meet local demand. US company Dresser-Rand was acquired by Munich-based Siemens in September 2014 for \$7.6 billion, giving the German conglomerate more access to LNG technology and the US market. "This cost-effective solution, developed by the Dresser-Rand business, allows the

operator, Frontier Natural Resources, to monetize unutilized gas assets at Tenaska Resources Mainesburg gas field, located in the Marcellus shale play," said Dresser-Rand. Frontier Natural Resources is an independent gas producer focused on developing conventional and unconventional resources in the US. The LNG facility produces LNG for use in high horsepower machinery use in the shale gas plays of Pennsylvania. "LNG is ideal for high horsepower machinery including marine, rail, mining, over-the-road trucking, drilling, fracturing and power equipment," Dresser-Rand explained. The scope of supply includes a standardized LNGo liquefaction solution consisting of four different modules, each handling one step of the liquefaction process. "The whole LNGo system can be transported on eight trucks, is deployed directly at the gas field and has a footprint of approximately 508 square meters, roughly the size of a basketball court," the company explained. "This project demonstrates our unique capabilities to deliver innovative solutions for oil and gas applications that help our clients maximize the value of their assets," said Michael Walhof, sales director for Distributed LNG Solutions for Dresser-Rand. "We are proud to provide Frontier Natural Resources with a reliable, robust solution to liquefy natural gas and cost-effectively move it to market," added Walhof. The LNGo system is manufactured by Dresser-Rand at a facility near the town of Painted Post in upstate New York. "The small-scale LNGo solution is self-sufficient and eliminates the need to establish an expensive gas pipeline infrastructure or arrange for long-distance trucking of LNG from centralized plants to point of use. Furthermore, it can be deployed in rough terrain or remote regions. It can function as a decentralized solution where the requisite pipeline infrastructure is lacking, or as an onsite transformation solution to reduce or eliminate flaring of petroleum gas at, for example, oil rigs or producing gas fields," it added.

ENGIE, the French energy company, is overseeing an overhaul of its subsidiaries as its natural gas pipeline company prepares to take over its LNG terminal operator. The LNG terminal owner Elengy has signed a preliminary accord to be acquired by another Engie company, GRTgaz. Elengy is owned 100 percent by Engie while GRTgaz has the French financial institutions, CNP Assurances

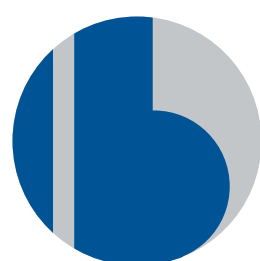
and Caisse des Dépôts, holding 25 percent of its shares and Engie owning the other 75 percent. Elengy is the operator of three French LNG import terminals, the Atlantic coast facility at Montoir de Bretagne and the Fos Tonkin and Fos Cavaou terminals near the Mediterranean port of Marseilles. Elengy's three terminals have regasification capacity of 21.25 billion cubic metres per annum of natural gas and a workforce of 376 employees. GRTgaz is Europe's second-largest natural gas transmission network operator with over 32,000 kilometres of pipelines and 3,000 employees. "For the shareholders of GRTgaz and Elengy, this planned acquisition responds to both European gas infrastructure challenges and market player needs," said Engie. "The market is currently subject to infrastructure consolidation where very large players are integrating several gas chain businesses, in particular LNG terminals and gas transmission networks," the company explained. "GRTgaz's acquisition of Elengy, bolstering GRTgaz with high quality LNG assets, would thus enhance France's position as a well-regulated market at the crossroads of international LNG trading," said Engie. Engie itself was born out of consolidation. Formerly known as GDF Suez, it emerged from the merger of French utility Gas de France with Franco-Belgian conglomerate Suez. "The parties will continue their discussions, respecting the rights of the employee representative bodies concerned, whom they will be consulting soon," said Engie. "As provided by applicable regulations, the planned acquisition will also be submitted for clearance to the French Energy Regulatory Commission (CRE) and to the governing bodies of the companies involved. The transaction would have no impact on the legal status of the two companies, GRTgaz and Elengy, nor any consequences for their employees," it added. France has a fourth LNG import terminal at the Channel port of Dunkirk. It was developed by Electricite de France and the other shareholders are Fluxys of Belgium, operator of the Zeebrugge import terminal, and French energy major Total. The GRTgaz pipelines from Dunkirk lead to both the French and Belgian gas transmission networks.

EUROPE took a step forward in liquefied natural gas marketing for the northwest region when the first small-scale LNG reload operation took place to

enable a cargo transfer between the Baltic state of Lithuania and Sweden. The operation involved half-a-dozen companies in the region, including Norway's Statoil, Skangas and Hoegh LNG. The permanent floating storage and regasification unit "Independence", owned by Hoegh and located in the Lithuanian port of Klaipeda transferred 15,000 cubic metres of LNG to the Dutch-owned small-scale carrier "Coral Energy". The

Skangas-chartered "Coral Energy" then took the shipment to the Skangas-operated import terminal in Lysekil in Sweden. The "Coral Energy" is owned by Dutch shipping line Anthony Veder. The operation is the first under a contract signed between Statoil, as the LNG supplier, and the two Lithuanian natural gas trading companies Litgas and Lietuvos Dujų Tiekimas, both part of Lietuvos Energija. "This marks an

important strategical step in making natural gas available for the land-based industry and the marine market in the area," the companies said. The Lysekil LNG import terminal in Sweden supplies the Preem refinery at the Swedish port. Skangas said the ship-loading exercise in the port of Klaipeda was the natural next step to further increase the support for the development of the small-scale market in Northwest Europe. "Adding this terminal



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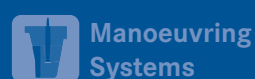


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increases possibilities and competition, which also gives security of supply and better opportunities for all parties,” Skangas said. Statoil and Skangas have already concluded other agreements as part of their business relationship, including Statoil supplying feed-gas to the Skangas LNG plant in Risavika, Norway. The Skangas-Statoil cooperation additionally includes a bunkering agreement for LNG-fueled platform supply vessels operating offshore Norway.

EVERGAS, the Denmark-based operator of a 26-vessel multigas fleet including new small-scale LNG carriers of 27,500 cubic metres capacity, has held a naming ceremony for its fifth vessel of a series built to carry US shale-gas ethane to chemical plants in Europe. The latest carrier, the “JS Ineos Innovation”, was named at a ceremony in Philadelphia, even though it was built in China at the Qidong shipyard of Sinopacific Offshore & Engineering. The vessel is the fifth in a series of six ordered from the Chinese shipyard and all carry the name of Inneos, the Swiss chemicals company that is the charterer for the ships that carry ethane, a constituent of shale gas. “The ‘Dragon class’ vessels are the largest, most flexible and advanced multigas carriers built to date,” said Evergas. The new Evergas vessels bear dragon symbols to show their Chinese origins. “Strong relations, strategic focus and an innovative approach between Evergas and Ineos have been key elements that allowed for the creation of a seaborne pipeline bringing US ethane across the Atlantic Ocean to Europe,” added Evergas. “They are a result of close collaboration with world-class makers with whom the development of these sustainable, efficient and highly advanced vessels were made possible,” the shipping company said. Copenhagen-based Evergas was effectively taken over in 2016 by Groupe Bourbon, a subsidiary of original owners, Jaccar Holdings, so that the companies can share services and cut costs. The Evergas multigas carrier “Ineos Intrepid” left the Markus Hook terminal near the US port of Philadelphia in March 2016 to deliver a 27,500 cubic metres cargo of US shale-gas ethane to Rafnes in Norway. This was the first time that US shale gas had ever been shipped to Europe. Jaccar has shipping as its main focus and has a combined fleet of several hundred vessels and has principal Far East offices in Singapore and Shanghai. Many of the ships serve the offshore oil and gas

industry. Its affiliate Groupe Bourbon is also among the market leaders in marine services for the offshore industry.

GAS ENTEC, the South Korean engineering company that provides equipment for small-scale LNG vessels and floating and onshore projects, said it delivered its gas-handing package for the first US LNG bunkering barge being construct at a shipyard in Texas. Gas Entec, based in the Korean port of Busan, also provided engineering services for the 2,200 cubic metres capacity vessel being built by Conrad Shipyards. Conrad said America’s first LNG re-fuelling barge would be completed and delivered in early 2017. The vessel’s delivery will signal the start of more LNG use in the North American maritime sector as shipowners respond to Emission Control Areas being gradually set up worldwide. It will serve as the bunker ship for two LNG-fueled container vessels built at the California shipyard in San Diego owned by General Dynamics NASSCO. The “Isla Bella” and its sister ship, the “Perla Del Caribe”, were constructed for the US TOTE shipping line to operate in US trading between Jacksonville in Florida and the US territory of Puerto Rico. Gas Entec said the main cargo containment system for the US bunkering barge is the GTT Mark III Flex storage tank licensed by French technology company GTT. The Korean company said its part in the project included taking charge of engineering and design of the LNG cargo and bunkering handling system and it also supplied the related main equipment as well as commissioning services. Gas Entec said its additional equipment included automation and emergency shut-down systems and communications and fire and gas leak detection systems to meet American Bureau of Shipping and the US Coast Guard requirements. “This was remarkable for a small Korean engineering firm to supply the main engineering services and equipment for the world’s first small-scale LNG bunkering vessel project in the USA,” said Gas Entec Chief Executive Chong-Ho Kwak. “For the Integration Automation Service, Gas Entec applied its product named ‘iCAMS’ for the first time to satisfy ‘unmanned condition’ requirements,” he added.

GASLOG LTD, the Monaco-based shipping line with a fleet of 28 liquefied natural gas carriers and with charter customers such as Royal Dutch Shell, has

announced that Chief Financial Officer Simon Crowe is stepping down. Crowe has told the company he would leave his position on June 30, 2017. A statement added that in order to facilitate a smooth transition, Crowe was prepared to remain with the company for now as the search for his replacement proceeds. “Simon joined GasLog at a critical point as it evolved from a private business into a leading publically traded LNG transportation company,” said Peter Livanos, Chairman of GasLog and Director of US-listed affiliate GasLog Partners. “During the years Simon has held the role of CFO at GasLog, he has been instrumental in building a strong finance team and executing a great number of successful capital market transactions, the most significant of which was the initial public offering of shares in our (US) Master Limited Partnership,” added Livanos. “I would like to wish Simon every success in his continuing career,” he said. Paul Wogan, GasLog Chief Executive, said he had enjoyed working closely with Simon over the last four years, “absorbing his energy and passion” for the business. “His support and influence on the business will certainly be missed. Simon is committed to ensuring a smooth transition for his replacement and we are hopeful that an announcement on this will soon be forthcoming. We all wish Simon well as he moves onto other opportunities,” stated Wogan. Outgoing CFO Crowe said that since joining GasLog he had been “part of something very special” as we have profitably grown from 10 vessels in 2013 to 28 today. “It has been very rewarding to help build what is certainly a world-class operator of LNG carriers, and develop a first class finance team,” said Crowe. “With the company strategically and financially well positioned, I feel the time is now right for me to seek new challenges outside of GasLog and GasLog Partners. I wish the company well and look forward to watching it flourish,” he added.

HOEGH LNG, the Norwegian fleet owner and project developer specializing in floating storage and regasification units, has signed an agreement with South Korean shipbuilders Samsung Heavy Industries and Hyundai Heavy Industries for its next series of FSRUs. Hoegh has signed one firm shipbuilding contract for one FSRU and an option for three additional FSRUs from the Samsung yard. The Samsung FSRUs will have a storage capacity of 170,000 cubic metres and will

have regasification equipment designed by Hoegh LNG and gas system and propulsion maker Wartsila of Finland. Each of the FSRUs will have regasification capacity of 750 million standard cubic feet per day. Hoegh said the vessels would also have full trading capabilities as conventional carriers. The FSRU with the firm contract will be delivered in May 2019 and the optional FSRUs will be delivered at six months intervals thereafter if finally confirmed. Hoegh also signed a firm contract with another Korean shipyard Hyundai for an FRSU to be delivered in the fourth quarter of 2018. The Hyundai-built FSRU will have a storage capacity of 170,000 cubic metres and regasification capacity of 1,000 MMscf per day, with full trading capabilities. Hoegh also said two other newbuilds ordered from Hyundai would be allocated to serve as import facility in the West African nation of Ghana and in Pakistan. It signed a 20-years FSRU charter with Quantum Power for the Tema LNG project in Ghana and a charter for the same term with Global Energy Infrastructure Limited for the second import facility being provided for Pakistan at Port Qasim, near Karachi. “The company has spent considerable efforts optimizing its FSRU portfolio, maximizing charter revenues from FSRUs under construction and reducing overall technical risks,” it explained. “The company has therefore decided to allocate FSRU No. 7 (HHI hull number 2552) to serve the Quantum Power charter in Ghana and to allocate FSRU No. 9 (HHI hull number 2909) to the GEI charter in Pakistan,” said Hoegh. “We are very pleased to have completed this agreement with SHI, a yard we know well as SHI built Hoegh LNG’s first two FSRUs,” said Hoegh President and Chief Executive Sveinung J. S. Stohle. “These units have shown excellent performance since their delivery,” added Stohle. “The agreement with SHI also marks a new era for Hoegh with FSRU newbuilding programs at two of the world’s biggest shipyards, which solidify our position as the leading FSRU provider to the LNG industry,” it stated. “I am very pleased that Höegh LNG through its newbuilding program and market position has been able to establish a contract coverage solution which is in line with our strategy of building new FSRUs,” said Stohle. “I am proud to see that through Hoegh’s innovative approach and in-house design of our FSRUs, coupled with our long-standing relationship with HHI, Hoegh has been able to secure a newbuilt FSRU in the shortest possible

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time,” he added in reference to the Hyundai order. “With this order, Høegh LNG now has 10 large size newbuilt FSRUs in operation or under construction, preserving our position as the market leader in the FSRU segment,” added the CEO.

HOEGH LNG, the Norwegian fleet owner and floating storage and regasification unit charterer, is changing its corporate structure to improve efficiency as its business moves forward with the recent placing of new FSRUs and with other projects planned. “In order to further improve the Group's excellent operating performance, Høegh LNG will set up a new division, the Operations Division, which will be headed by the Chief Operating Officer who will have responsibility for the technical and commercial management of all Høegh LNG assets in operation,” said the company. It added that Vegard Hellekleiv, previously Chief Technical Officer, had been nominated to the position of COO. Høegh said that another executive Oivind Iversen, who until 2016 headed Høegh's floating LNG activities, would replace Hellekleiv as Chief Technical Officer. “We have been very successful in growing our FSRU business, with currently six FSRUs and two LNGCs in operation, and we have another three FSRU projects coming on stream in the next 18 months in Ghana, Pakistan and Chile,” said Høegh President and Chief Executive, Sveinung J.S. Stohle. “Høegh LNG is the leading company in the FSRU segment, and we have a clear objective to further strengthen our position in this market,” added Stohle. “In order to optimize the way we work we are therefore adapting our organization to further improve our performance and competitive position,” said the CEO. The Norwegian company is currently negotiating several long-term FSRU charters and said a project called Penco LNG in the South American nation of Chile was one of the ventures making progress. It said the level of business development activity in the FLNG sector was currently high.

INPEX Corp., the Japanese liquefied natural gas developer and terminal owner, is boosting its domestic natural gas portfolio amid deregulation of the utility industries in Japan, ending the monopolies of city-gas and power companies. Inpex said it had started supplying regasified LNG from its Naoetsu import terminal in Joetsu City through a new pipeline to a factory owned by conglomerate Asahi.

Natural gas was being received by the Hokuriku Factory of Asahi Soft Drinks Co. through the Toyama Line extension of its natural gas trunk pipeline network that travels from Itoigawa City in Niigata Prefecture to Toyama City. Deliveries to its latest domestic customer come as Inpex is building its LNG assets overseas as the main developer and future operator of the Ichthys LNG export plant in the Northern Territory of Australia in a joint venture involving France's Total. The Inpex Australian plant will deliver cargoes on a long-term basis to Japanese utilities Tokyo Gas, Osaka Gas, Kansai Electric Power, Toho Gas and Jera Co. Inc., the joint procurement venture between Tokyo Electric Power and Chubu Electric. Inpex is additionally involved in the Prelude floating LNG project being pursued in Australia by Royal Dutch Shell. “The Hokuriku Factory of Asahi Soft Drinks is the third customer along the Toyama Line to which Inpex supplies natural gas,” the company said. The Hokuriku Factory is located 400 metres from the Nyuzen Valve Station on the Toyama Line, which Inpex made fully operational in October 2016. “Inpex has begun supplying natural gas including regasified LNG from Naoetsu Terminal in Joetsu based on a natural gas sales and purchase agreement signed in November 2016,” said Inpex. “The agreement provides the Hokuriku Factory of Asahi Soft Drinks with access to an efficient, long-term and stable supply of natural gas and will help it to reduce annual CO2 emissions by roughly 14 percent through the conversion of its fuel source from liquefied petroleum gas to natural gas,” added Inpex. LNG importers Inpex and Chubu Electric are also supplying wholesale electricity to city-gas companies Seibu Gas, Matsumoto Gas and Suwa Gas, sourcing the power from Diamond Power Corp., a Chubu Electric subsidiary.

KOSMOS Energy, the US LNG project developer with assets offshore Senegal and Mauritania in West Africa and now with BP of the UK as a partner, will see New York equity funds cash in on its success by selling their shareholdings to the public after a 58 percent price surge. Kosmos has issued a statement saying 30 million shares will be sold in an underwritten public offering. The shares are held by funds affiliated with Warburg Pincus and The Blackstone Group and amount to 7.7 percent of the company. They are valued at around \$210 million depending on the offer price. Kosmos has

368.7 million shares outstanding and the entire company is currently valued at \$2.7 billion. The sell-off to investors of some of a block of the Kosmos shares listed on the New York Stock Exchange comes as they have soared to \$7.06 per share on 12 January 2017 from \$4.47 per share in February 2016. Dallas, Texas-based Kosmos will not receive any of the proceeds from the sale of the common shares. UK-based investment bank Barclays Capital is acting as the underwriter of the offering and a prospectus has been filed with the US Securities and Exchange Commission. Kosmos recently told a gathering of analysts that natural gas resources for LNG production in the Mauritania-Senegal Basin can potentially surpass those offshore the southeast African nation of Mozambique, where onshore and floating LNG ventures are planned. Kosmos said the “transformative transaction with BP effectively funds 100 percent of Kosmos's portion of the Mauritania and Senegal expenditures for the next several years.” BP agreed to buy stakes in the West African licenses for \$916 million as the UK energy producer builds its natural gas business following an earlier acquisition in Egypt of a stake in the world-class Zohr field. Under the new schedule controlled by BP there will be two floating LNG production and export projects. First gas from FLNG Train 1 is scheduled for 2021 and the start of FLNG Train 2 is set for 2023. According to the US company, the Mauritania-Senegal FLNG projects are aiming to produce free-on-board LNG cargoes at a break-even price of less than \$5 per million British thermal units. Kosmos said the farm-out transaction with BP, first announced on December 19, 2016, demonstrated that frontier exploration can deliver competitive returns when executed correctly. Kosmos Chief Executive Andy Inglis is a former head of BP's upstream division. While Kosmos will retain exploration operatorship, BP will be the development operator “bringing deepwater experience and LNG development and marketing expertise.” Kosmos, BP, the state energy companies of Mauritania and Senegal, as well as a third original shareholder in the Senegal licence, London-based Timis Corp, aim to advance rapidly with the development of the key Tortue gas field for FLNG.

LNG Ltd, the Australian company developing LNG export plants in the US and Canada, has been required to issue a

second statement in under a year to the Australian Securities Exchange after a 23 percent surge in its shares in three days. LNG Ltd., whose ventures include the Magnolia LNG plant in Louisiana and the Bear Head facility planned for Nova Scotia received the ASX request after its shares jumped from A\$0.70 to A\$0.86 from January 10 to January 13. The company, which also has a lease for a planned Fisherman's Landing coal-seam-gas-to-LNG venture in Gladstone in the state of Queensland, where three similar plants are already in production, told the ASX that it was unaware of the reasons behind the share surge LNG Ltd was obliged to issue a similar statement to the ASX on June 9, 2016, when its shares had also taken off during a short period amid takeover speculation. In addition to the price change, the ASX also noted “the significant increase in the volume of the company's securities traded” in the past few trading days. In light of this, the ASX asked the company to respond to the following questions: “Is the company aware of any information concerning it that has not been announced to the market which, if known by some in the market, could explain the recent trading in its securities?” In response, LNG Ltd said it was “not aware of any information concerning it that has not been announced to the market” which, if known, could explain the recent trading in its securities. “The company does not have any other explanation for the price change in the securities and we confirm that the company is in compliance with the listing rules,” LNG Ltd added, in reference to its obligation to disclose any significant information to all shareholders. In addition to developing the medium-scale Magnolia and Bear Head ventures in North America and holding a site lease agreement for the proposed Queensland CSG-to-LNG project, LNG Ltd. also owns its own patented liquefaction processing technology system called the optimized single mixed refrigerant (OSMR) process. LNG Ltd., like others in the sector, has seen its shares fall over the past two years because of the slump in oil and LNG markets caused by oversupply. The company's market capitalization has gone from a high of A\$2 billion (US\$1.5Bln) in 2015 to A\$543 million on June 9, 2016, down to A\$414M on 16 January, 2017.

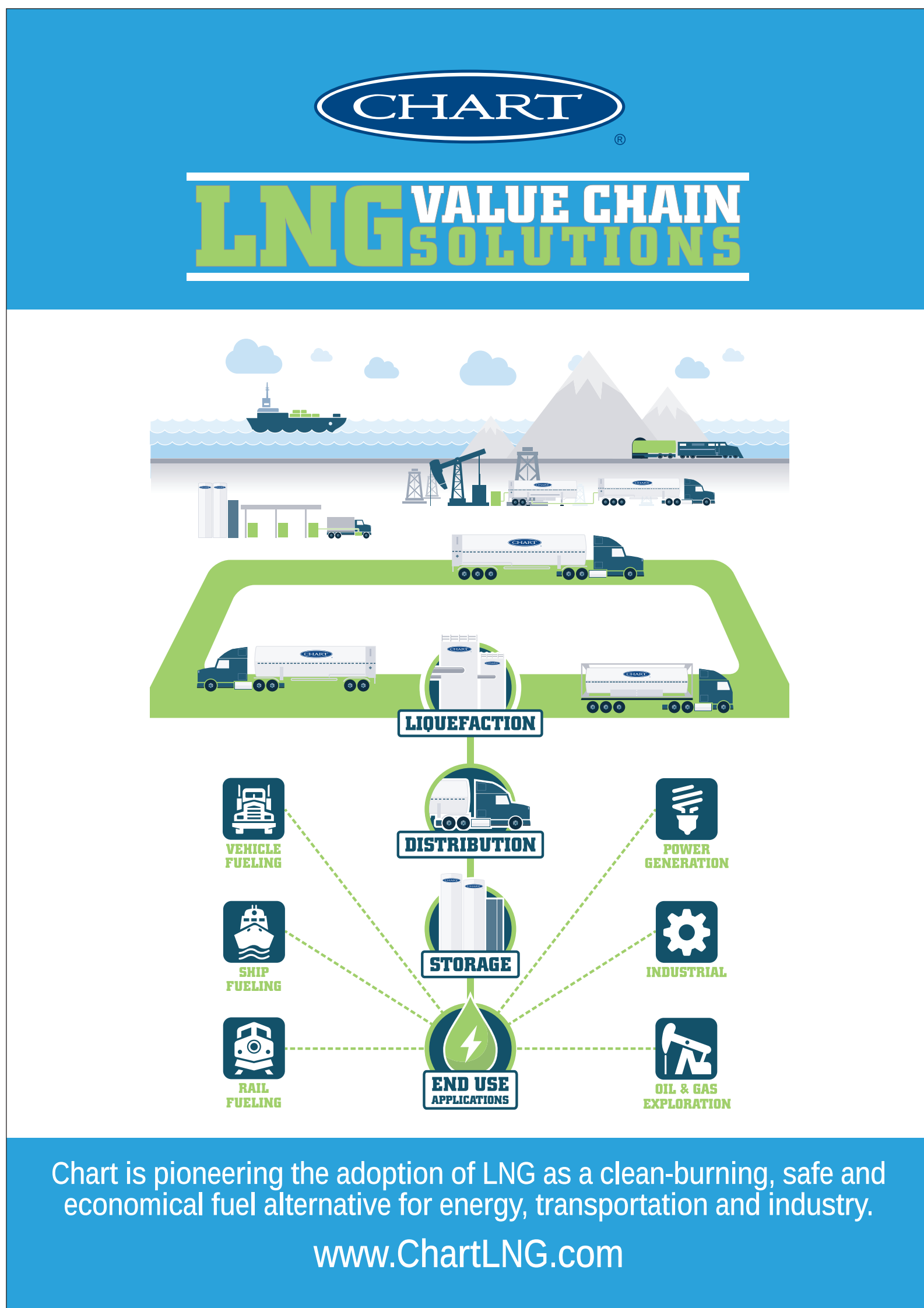
MICOPERI Spa of Italy has been awarded the contract for the engineering, procurement and construction of the

onshore and offshore facilities for the venture run by Quantum Power and scheduled to come on line in 2018. The Italian firm will start work soon on the LNG import facility to be set up at the port of Tema, 25 kilometres east of Ghana's capital Accra. The Tema project led by Quantum has already signed an offtake deal with Ghana National Petroleum Corp. (GNPC) as well as a charter agreement for a floating storage and regasification unit with Hoegh LNG of Norway. The gas-to-power project will require about 3.40 million tonnes per annum of LNG, equivalent to 500 million standard cubic feet of gas per day. The project comprising a capital outlay of more than \$550 million will be implemented on a build-own-operate-transfer basis, with the assets transferring to GNPC after a 20-year term. Quantum Power is a pan-African energy infrastructure investment platform, currently operating in several countries in the region and with offices in London and Cyprus. It is affiliated with the Quantum Pacific Group, an international group of businesses with interests across a broad range of industries. The EPC contract won by Micoperi is for the construction of all offshore and onshore project infrastructure, which will connect the FSRU to Ghana's gas distribution network. The infrastructure construction is scheduled to start in several weeks and be completed in about a year. "We are delighted to have been awarded the contract with Quantum Power for their new LNG import terminal in Ghana, which is of strategic importance, not only for Ghana but also the wider West Africa region," said Micoperi's Vice President,

Claudio Bartolotti. "Micoperi's established experience in Ghana and in delivering similar projects in other markets ensures execution to the highest international

standards," added Bartolotti. "Partnering with Micoperi on delivering this critical infrastructure for Ghana is the culmination of a long and arduous

process," said Quantum Power's Chief Executive Matty Vengerik. "This project shall restore Ghana's energy reliability, security and regional competitiveness. We



are looking forward to its timely commissioning,” he added. Golar LNG, the other Norwegian fleet owner and FLNG project developer, has signed a contract for another Ghana venture, also located close to the capital. The “Golar Tundra” FSRU arrived off the coast of Ghana at the end of May 2016 and issued its notice of readiness the following month. However, the venture was delayed and the subject of a legal dispute. It has been chartered to a project owned by West African Gas Ltd, a joint venture in Ghana run by Nigerian National Petroleum Corp. and Sahara Energy Resources.

MOROCCO is hoping to join the ranks of global liquefied natural gas importers after its national power and water company appointed international financial and legal advisers for the development of LNG and power infrastructure to meet the North African kingdom's rising energy needs. The Moroccans are hoping to follow the path of Egypt, Jordan, Kuwait and the United Arab Emirates to become the latest Arab-speaking nation to purchase LNG shipments. According to Morocco's Office National de l'Electricite et de l'Eau Potable (ONEE), it plans to import an initial 5 million tonnes per annum of LNG. It has appointed the consultants to advise on an import terminal and adjacent gas-fired power plant, as well as the construction of a jetty for LNG carriers, said Casablanca-based ONEE. It has chosen as its financial advisers the international bank, HSBC Middle East Ltd, while the Paris office of law firm Ashurst LLP will give legal advice on the multiple projects. The various gas-to-power ventures will cost an estimated \$4.5Bln, including the import of LNG up to 2025, the construction of a jetty, terminal, pipelines and a gas-fired power plant. Morocco is a net importer of energy. It does produce some amounts of its own oil and natural gas, though these volumes are not sufficient to cover its needs. All current LNG importers among the Arab nations use floating storage and regasification units deployed at the ports of Aqaba in Jordan, Ain Sokhna in Egypt, Dubai in the United Arab Emirates and Mena Al Ahmadi in Kuwait. Kuwait is the longest-standing importer through an FSRU terminal set up in 2009, while Dubai's facility dates from late 2010. Morocco currently receives natural gas supplies from the Maghreb-Europe Pipeline which transits the country on its way from Algeria to Spain and Europe. In lieu of charging the pipeline company transit fees, Morocco instead receives

payment in the form of gas supplies. Morocco's near neighbour Spain has Europe's largest network of LNG import terminals and is also a re-exporter of cargoes. Recently in Morocco there has been an increased interest in upstream exploration in the country as it is believed to hold shale resources in its Saharan territories and oil and gas in the Atlantic Ocean offshore the country's west coast. Woodside Petroleum, the largest Australian LNG player with two liquefaction plants in operation in its own country, in November 2014 entered into a contract for an exclusive reconnaissance licence in an offshore block. The block, known as the Rabat Ultra Deep Offshore area, comprises a total of 36,737 square kilometres with depths ranging from 1,700 metres to 4,400m.

NEXTDECADE, the US LNG project development company run by former Royal Dutch Shell LNG senior executive Kathleen Eisbrenner, has signed a land lease for a second potential liquefaction and export project in Texas. Eisbrenner's company NextDecade has signed its land agreements with the State of Texas and with the Texas City municipal authorities for a site of around 1,000 acres at Shoal Point for the potential development of a “multi-billion dollar” LNG export facility. Texas City owns almost 376 acres at Shoal Point, while the Texas General Land Office manages the adjoining 618 acres of state land. In addition to the potential Shoal Point project with deep water access to the Gulf of Mexico, NextDecade's current main focus is its Rio Grande LNG project planned for the port of Brownsville in Texas. Eisbrenner's role at Shell before founding NextDecade was as Executive Vice President for Global LNG Development. She also worked in senior management in the US with El Paso Energy Corp. and was one of the founders of Excelerate Energy, the US floating LNG project developer. The Rio Grande venture is planning to produce 27 million tonnes per annum and is advancing rapidly through the Federal Energy Regulatory Commission (FERC) permitting process. “The project at Shoal Point will benefit from NextDecade's ability to replicate much of the design and engineering work done for Rio Grande LNG, a project that is expected to have one of the lowest construction costs of any LNG production facility in the world,” the company explained. The agreement comes as the State of Texas continues to draw international attention following

significant new natural gas finds totaling over 90 trillion cubic feet (tcf) in 2016 and as global buyers increasingly seek new, long-term competitive natural gas supplies to support their energy needs. “Now more than ever, the US has the potential to benefit from the incredible natural gas resources we have right here in Texas,” said Kathleen Eisbrenner, NextDecade Chairman and Chief Executive. “The US is the most competitive source of LNG in the world and NextDecade is looking forward to bringing new supply to the global marketplace from the heart of the global energy industry,” she added. Together, the Ports of Houston, Texas City, and Galveston form the largest port complex in North America and the NextDecade project would be the first LNG facility in the area. “The Shoal Point site, located just east of Texas City's major petrochemical industrial complex and 40-miles southeast of Houston, provides an attractive location for an LNG export terminal,” said NexDecade. The ample acreage at Shoal Point allows for significant design flexibility and potential expansion capability, increasing the project's appeal to potential customers and investors. The site also benefits from its deep-water access and proximity to nearby natural gas pipeline infrastructure. Eisbrenner and her company signed an accord in December 2016 with the firm Flex LNG to cooperate in marketing floating import terminals as well as US LNG volumes to customers. NextDecade and Flex LNG signed a heads of agreement to create “a full value chain solution” for customers looking to purchase LNG from NextDecade's Rio Grande project. The two companies said they would develop floating storage and regasification units (FSRUs) and dockside facilities for international customers of NextDecade's, with the LNG supply also provided by the Eisbrenner company. Flex LNG's main assets are two 174,000 cubic metres capacity LNG carriers that are under construction at the Daewoo Shipbuilding and Marine Engineering shipyard in South Korea for delivery in 2018. Flex is controlled by Seatankers Management Co. Ltd., a company of Norwegian shipping magnate Fredriksen. The agreement will reunite two pioneers of the floating LNG business, NextDecade Chair and Chief Executive Eisbrenner and Jonathan Cook who will become CEO of Flex LNG early in 2017. In 2003, Eisbrenner founded Excelerate Energy where she originated and brought to market the first FSRUs which were turned into fast-track import

terminals. Cook was Eisbrenner's Chief Operating Officer at Excelerate and helped lead the development, construction and operation of the FSRU fleet.

NORWEGIAN pipeline natural gas, the main competition to LNG in the UK and four other European markets as well as to Russian gas, has set a new record for exports in 2016 when 108.56 billion cubic metres were delivered. Gassco, the Norway-based operator of the pipelines said that gas flows to the UK, Germany, Belgium and France just managed to surpass the previous record of 108.44 Bcm from the Norwegian continental shelf set in 2015. The total was the equivalent of 80 million tonnes of LNG, more than the output of the largest LNG producer Qatar, currently at around 77 million tonnes per annum. “Deliveries show that European demand for Norwegian gas is higher than ever,” said Frode Leversund, Chief Executive of Gassco. “It's also gratifying that we've been able to set a new record in a year characterized by extensive maintenance work,” added Leversund. He said that one of Gassco's objectives as the operator for Norway's integrated gas transport system is to run the network with the highest possible regularity. “This ensures that customers in Europe and the UK have secure and reliable gas deliveries,” Gassco explained. The Norwegian deliveries compare favourably in terms of energy security with the 179.3 Bcm shipped by pipeline to Western Europe in 2016 by Russia's Gazprom. The average regularity for the transport system during 2016 was 99.71 percent compared with 99.38 percent the year before. Deliveries of natural gas liquids (NGL) and condensate from the Gassco-operated process plants at Karsto and Kollsnes near Bergen in western Norway also rose in 2016. They reached a total of 10 million tonnes, compared with 9.6MT the year before. Norway exported about 95 percent of its natural gas production mostly by pipeline. It also provides the main pipeline competitor to Russia's Gazprom and sends more than 30 percent of its gas exports through its processing plant at Kollsnes. The UK, the largest European natural gas market, has two main pipelines from Norway. There was maintenance work during 2016 at the Karsto plant and at Sleipner in the North Sea, meaning that all gas from the Ormen Lange field in the Norwegian Sea had to be sent directly to Easington on the English east coast. The southern leg of the Langede link is a 44-inch pipeline from

the Sleipner East hub to the receiving terminal at Easington. After arriving at the UK terminal, the gas is regulated to the correct pressure and temperature before being passed to the downstream transport operator. This part of the UK system became operational in June 2006. In the north of the UK, the main receiving terminal is at St Fergus in Scotland, north of Aberdeen. It serves more than 20 offshore fields and became operational in 1977, receiving lean gas through the Vesterled system as well as rich gas from the British Frigg pipeline. Other key routes include Germany's two Europipe terminals, its Norseas gas facility and Belgium's Zeepipe receiving terminal in the port area of Zeebrugge. The Zeepipe facility is about five kilometres from landfall and the LNG import terminal at Zeebrugge port. Norwegian gas for France comes ashore on the Channel coast near Dunkirk and Denmark also receives Norwegian gas at Nybro. Despite its position as a European energy superpower, Norway remains a modest LNG producer, mainly from its Hammerfest liquefaction plant. That said, the Norwegians have been influential promoters of LNG as a transition fuel towards a cleaner energy future. The LNG facility on Melkoya Island came on stream in 2007 as the first baseload plant in Europe and produces around 4.2 MTPA from a single Train. Norway also has several small-scale LNG facilities, including three liquefaction plants with a combined capacity to produce 440,000 tonnes per annum of LNG.

OPHIR ENERGY of the UK, said the Fortuna floating LNG project offshore Equatorial Guinea

in West Africa remained firmly on schedule for a final investment decision in the first half of 2017. The company has a joint venture agreement to develop the

Fortuna FLNG project with Norwegian shipping company Golar and oil services firm Schlumberger to produce free-on-board cargoes priced at around \$6 per

million British thermal units. Ophir signed an accord in November 2016 with a joint subsidiary of Golar and Schlumberger called OneLNG. The

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shareholders agreement established a joint operating company to develop the Fortuna FLNG project from feed-gas resources in Block R offshore Equatorial Guinea using Golar's production hull technology. OneLNG and Ophir have 66.2 percent and 33.8 percent ownership respectively of the joint venture entity. The Fortuna FLNG company is now working on facilitating the financing, construction, development and operation of the project, which will own Ophir's share of the Block R licence and the "Gandria" FLNG vessel. With the FID still on track for the first half of 2017, the venture is expected to come on stream in 2020. Ophir said its own operating group expected to finish 2017 with a net cash position of \$75-\$100 million, and with the refinancing of its debt facilities in 2017, a gross cash position of \$350-\$400M. Ophir made its statement on Fortuna FLNG in a trading update that also included the latest report on the Kerendan natural gas field offshore Indonesia, on stream since September 2016. The gas field is being connected to a 290-kilometres pipeline linking Kerendan to the regional grid and will enable gas production from Kerendan to ramp up to the full daily contract quantity of 20 million standard cubic feet per day. However, Ophir said it continued to accrue a take-or-pay receivable due from Indonesian state-owned power company Perusahaan Listrik Negara for 80 percent of the contract volume. Separately, Indonesian regulators have recently approved the West Kerendan-1 production plan. "This is a critical step to enabling Ophir to monetise an additional 50 billion cubic feet of gas in the Kerendan area which is expected to add around 7 MMscf/d to the production profile from 2019," explained Ophir. It added that investment decisions would also be made during 2017 regarding options to commence further wildcat exploration activity in Myanmar, Indonesia, Malaysia and Equatorial Guinea in the six to 18 months. The UK company also revealed that preparations for recommencing operated deepwater oil exploration with the Ayame-1 well in the Ivory Coast in West Africa are at an advanced stage.

POINT COMFORT, the near-shore LNG project in Texas, has submitted an application to the US Department of Energy to export shipments to countries with a US Free Trade Agreement. The company behind the application is an operator called Lloyds Energy Group with offices in Bermuda, Dubai and Moscow.

Lloyds Energy was established in 2013 with the aim of becoming a global LNG developer in the LNG supply chain. It has no connection with Lloyd's Register, the UK-based classification society. The company is planning its Point Comfort facilities in Calhoun County, Texas. "This is one of the first steps in developing the LNG project, which would bring significant and lasting benefits to the South Central Texas Coastal region," the company said. "Lloyds Energy is strongly positioned to meet client demand, and submitting our Point Comfort LNG FTA application is an important first step towards making the final investment decision," said Philip Holland, Chief Executive of Lloyds Energy. "The US has an abundant supply of natural gas and the international market has a growing demand for cleaner, more-efficient fuel," added Holland. Calhoun County Port Authority Board Chairman Randy Boyd said the project would help to stimulate economic development. "Point Comfort LNG will bring hundreds of millions of dollars of revenue to the county and state as well as provide hundreds of long-term jobs," said Boyd. Lloyds Energy said it would use two near-shore floating LNG vessels with each unit able to produce 4.5 million tonnes per annum, as well as having additional support barges and related onshore facilities. "Over the course of three years, Lloyds Energy has grown rapidly in the fields of Near Shore LNG," said the company. "It has established strong international alliances with offtakers and two major engineering groups specializing in LNG," it said. In April 2106, Lloyds Energy signed a letter of intent with global engineering companies KBR Inc. of the US and South Korea's Daewoo Shipbuilding and Marine Engineering for front-end engineering and design and other services related to its Near-Shore FLNG concepts.

SANCHEZ Energy Corp., the Houston-based company with previous downstream LNG ambitions, has partnered with the New York-based Blackstone equity fund group to acquire 318,000 operated acres in the Western Eagle Ford shale play in south Texas for \$2.3 billion. Sanchez and Blackstone signed a "strategic 50-50 partnership" for the purchase agreement with previous owner Anadarko Petroleum Corp. "Sanchez Energy and Blackstone will use cash on hand and commitments received from financial partners and commercial banks to provide financing for the

acquisition and anticipate that the transaction will close in the first quarter of 2017," they said. The acreage purchased from Anadarko is close to Sanchez's existing natural gas wells in its Catarina play in the Eagle Ford basin. Although Sanchez is not yet involved in any LNG export projects its feed-gas is likely to be purchased by tolling agreement holders in ventures under construction on the Gulf Coast of Texas and Louisiana. Blackstone's participation was needed to enable the acquisition to be completed. The equity fund has \$10Bln in managed assets, including in the energy sector. The transaction comes as Sanchez is also seeking to expand its Catarina project in the Eagle Ford, where its production and assets are split between shale gas and shale oil. The Texan operator, which only became a public company in 2011 and is currently valued at \$577 million, is mostly focused on Eagle Ford drilling and it already has 650 producing wells and about 200,000 net acres of its own. "Current production of approximately 67,000 barrels of oil equivalent per day (70 percent liquids) from the acquired assets, provides a substantial amount of immediate cash flow," the companies said. "Estimated total resource potential of over 1,100 MMBoe," they added. Sanchez, an independent exploration and production company, also has a position in the Tuscaloosa Marine Shale in Mississippi and Louisiana. However, in October 2016 Sanchez received about \$345M in cash for the sale of its midstream assets in the western section of the Eagle Ford to Carrizo Oil & Gas, Inc. "This accretive and transformative acquisition more than doubles our drilling inventory, increases Sanchez Energy's resource potential by over 550 MMBoe and provides a path for strong growth within projected cash flow," said Tony Sanchez, III, Chief Executive of Sanchez. "With the asset strategically located adjacent to our existing Catarina asset, we anticipate substantial operating synergies and other benefits arising from the scale and concentration of our Eagle Ford position. Our continued focus on the Western Eagle Ford, expertise at multi-bench development, efficient cost structure and strong liquidity position will enable us to create significant value from the acquired assets", the CEO said. "Upon completion of the acquisition, we will triple our exposure to the Upper and Middle Eagle Ford trends that have been successfully developed by the company at Catarina. The Upper and Middle Eagle Ford sections thicken in Southern Dimmit

County, where the majority of the acquired leasehold is concentrated. Upon closing the transaction, we believe we will have locked up the core of the trend within the volatile oil window. With the ability to duplicate the cost structure of our Catarina and Maverick operations throughout the Comanche Eagle Ford Asset, we expect to further improve operating efficiencies while enhancing our capability to achieve sustainability of well cost reductions over time," explained Sanchez. "We are looking forward to working collaboratively with Blackstone in the development of these assets and to facilitate the growth of the company," stated Sanchez. Angelo Acconcia, a Senior Managing Director at Blackstone Energy Partners who oversees their oil and gas investments, said, "We are excited to form this strategic partnership with Sanchez Energy, to help effectuate this transformative acquisition and to help Sanchez Energy grow and facilitate future acquisitions in the area."

SANTOS, the stakeholder in three Asia-Pacific LNG export joint ventures, has completed the sale to Cooper Energy of its natural gas assets in the Australian state of Victoria as the company continues with restructuring. Adelaide-based Santos is selling assets and concentrating on activities such as LNG. Santos also recently raised A\$1.5 billion (US\$1.12Bln) in a placement and share purchase plan after becoming the latest Australian company to announce a corporate overhaul to weather the global slump in energy markets and to reduce debt. The assets acquired by Cooper include interests in producing gas assets, gas projects and plant in the Otway and Gippsland Basins. Santos operates the Gladstone coal-seam-gas-to-LNG plant in Queensland and has stakes in the ConocoPhillips-operated Darwin plant in the Northern Territory and the ExxonMobil-run Papua New Guinea LNG facility. Cooper, also based in Adelaide, said it had now taken over most of the various Santos gas assets in Victoria in southeast Australia. Cooper has paid an initial \$61 million in cash plus working capital adjustments to Santos with a conditional payment of another \$20M linked to the Sole Gas Project. The gas assets acquired include a 50 percent interest in the producing Casino-Henry gas project in the offshore Otway Basin and a 50 percent interest in the Sole Gas Project in the Gippsland Basin, taking Cooper's equity in this project to 100 percent. Cooper also bought a 50 percent

interest in the Orbest Gas Plant in the Gippsland Basin, giving Cooper full ownership of the plant. Santos Chief Executive Kevin Gallagher had initiated a December 2016 share placement as part of a strategy to improve the company's financial position. Another Australian company, Origin Energy, which is a major shareholder in the Australia Pacific LNG plant in Queensland, also launched a major corporate overhaul at the end of 2016 that included floating off its conventional natural gas assets as a separate company while keeping APLNG and related assets.

SHELL Shipping LNG carrier “Galea” supplied a cargo from Spain to Malta, the Mediterranean island nation and the smallest member of the European Union, to help get its floating storage unit (FSU) project underway in Marsaxlokk Bay. A shipment was delivered by the 136,425 cubic metres capacity vessel to the FSU “Armada LNG Mediterrana”, set up to supply regasified LNG to the nearby Delimara power station. The “Armada LNG Mediterrana” arrived in Malta in October last year. It was built under a \$300 million contract which the Malaysian offshore energy services company, Bumi Armada, won from Malta’s ElectroGas. The FSU is a conversion of the Japanese Mitsui Osk Lines Moss-type LNG carrier “Wakabu Maru”. It was turned into an FSU at the Keppel Shipyard in Singapore over a 17-month period. The floating LNG import facility can now be used on a continuous basis, without dry-docking interruption, during a period of up to 20 years. It is designed to feed LNG for regasification and use by the 400-megawatt

onshore Delimara power plant. “The people of Malta will now be able to breathe cleaner air and break away from the old, inefficient and heavy fuel oil

dependant plants, to a new energy mix, based on gas,” the government said. The arrival of the Shell cargo from the Sagunto import terminal in southeast

Spain on the vessel “Galea” was part of the commissioning process of the “Armada LNG Mediterrana” and the new gas-fired power station built by ElectroGas. While

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LNG will be imported for the Maltese gas-fired power plant, the long-term aim of Malta is to have a pipeline link with Italy, one of EU's largest pipeline gas imports.

SKANGAS, the Nordic liquefied natural gas supplier and facility operator, said the LNG-powered fast ferry “Megastar” owned by the Tallink shipping company in the Baltic state of Estonia was bunkered for the first time at the new Pori LNG import terminal in Finland. The vessel is scheduled to have its maiden voyage from the Estonian port of Tallinn to the Finnish capital Helsinki in late January. The “Megastar” was constructed at the Meyer Turku Shipyard in Finland and is the latest in a growing number of newbuild ships in the Nordic region to be fuelled with LNG to be fully compliant with the stricter regulations of the Emission Control Areas created in northwest Europe and elsewhere. “We’re happy that ‘Megastar’ is now ready for operation and we’re able to supply her with LNG,” said Skangas Marketing Director Tommy Mattila. “Thanks to LNG, the engine exhaust gases contain hardly any nitrogen oxides, which are particularly harmful as regards the Baltic Sea. We want to offer the shipping industry reliable, safe and efficient LNG bunkering,” added Mattila. Skangas owns the Pori import terminal and has LNG production plants in Risavika, Norway and Porvoo, Finland, as well as LNG reception terminals in the Norwegian town of Ora and at Lysekil in Sweden. The Nordic company is also developing Finland’s second LNG import terminal at the port of Tornio to be operational in early 2018. Skangas and its Finnish parent company Gasum are additionally involved in widening LNG use for trucks and for small-scale distribution. The LNG-powered ferry “Megastar” is 212 metres long and can accommodate 2,800 passengers. The vessel will operate between Helsinki and Tallinn at a service speed of 27 knots. The two stainless steel LNG tanks are located below deck and have a total volume of 600 cubic metres. The construction of the fast ferry began in summer 2015 and the launch took place in July 2016. “It has been great to participate

in the construction of the new-generation LNG-powered Tallink ‘Megastar’, yet more proof of Meyer Turku being a global forerunner in the construction of LNG-powered ships,” said Meyer Turku Project Manager Kari Toivonen.

STEELHEAD LNG, the Vancouver-based energy company focused on liquefied natural gas project development in the province of British Columbia, has hired experienced global LNG industry executives Paul Sullivan and Gerry Peereboom to help push forward its planned operations. Sullivan is the former Senior Vice President of Global LNG and Floating LNG at the Australian-based Worley Parsons Group. Nigel Kuzemko, Chief Executive of Steelhead LNG, said Sullivan had been appointed Vice President of Projects and was one of two executives hired. Steelhead, which is backed by native North American First Nations in its joint venture developments, additionally named Gerry Peereboom, as its new Vice President of Integration. Peereboom has more than 38 years of international experience on major oil, gas and LNG projects for companies such as Houston-based Noble Energy, BP of the UK and US company Amoco Corp. Steelhead said new executive Sullivan has had a long career in engineering and construction, with more than 25 years of experience in LNG import and export projects. He previously led the front-end engineering division at BG Group, where he was involved in the development, from concept to implementation, of the company’s liquefaction and regasification projects. “He was instrumental in developing Atlantic LNG, BG’s first grassroots liquefaction project in Trinidad. He has also previously served as the Development and Projects Director for Whessoe Oil & Gas, where he was responsible for front-end engineering, product innovation and project development, together with operations responsibility for the western hemisphere, India and East Asia,” said the Canadian company. Steelhead is backed by two First Nation groups and is exploring two separate ventures in BC. Steelhead said

in September 2016 that it was continuing to refine its LNG concept design to make use of floating LNG production and storage units moored to marine jetties. It explained that the concept would contribute to the planned “low-impact, low-cost” development of Steelhead’s proposed Malahat LNG venture with the Malahat First Nation. FLNG is also the concept for the planned Sarita project with the Huu-ay-aht First Nation, which aims to develop a venture at Sarita Bay at the southern end of the Alberni Inlet. That second project would be located on Huu-ay-aht First Nation land at Sarita Bay, about 10 kilometres north of Bamfield, and about 70 kilometres southwest of Port Alberni. The Sarita project is in the preliminary engineering and conceptual design stage. Steelhead has also recently joined forces with Canadian exploration and production company Seven Generations Energy. The arrangement, through which Seven Generations has also acquired a minority interest in Steelhead, is expected to provide potential new markets for the explorer as well as increased certainty of feed-gas supply for Steelhead. Seven Generations has assets in the Kakwa River project, located about 100 kilometres south of its operations headquarters in Grande Prairie, Alberta. “Steelhead LNG is at an exciting point and has the potential to be a game changer in the LNG industry,” said Sullivan. “I look forward to overseeing the next phase of development of the company’s At-Shore LNG export projects, which have the potential to deliver some of the lowest cost LNG to international markets,” he added. Steelhead said Peereboom would lead the schedule, risk assessment and risk mitigation activities in his new role, while also dealing with new upstream partner Seven Generations. Peereboom will also oversee the development and application of Steelhead’s environmental stewardship. “I see Steelhead as one of the most dynamic and innovative companies in the industry and am excited to join the team,” said Peereboom. Both Sullivan and Peereboom will be based at Steelhead’s corporate headquarters in Vancouver.

TEXAS LNG, the midscale liquefaction and export projects planned for the port of Brownsville, has entered into its second phase of marketing after signing up some customers from Southeast Asia and China. The US venture, led by co-founders and industry veterans Vivek Chandra and Langtry Meyer, is already well into the permitting process of the Federal Energy Regulatory Commission as well as front-end engineering and design. The Texas project is for an export plant with initial capacity of 4 million tonnes per annum using the Air Products propane pre-cooled mixed refrigerant LNG processing system. The plant will be constructed on a 625-acre site on the north shore of the Brownville Port’s deepwater ship channel. The Department of Energy has granted an export permit for the venture that will be developed as a tolling facility. Under this system, tolling contract holders will secure liquefaction capacity and provide their own feed-gas resources. Texas LNG said its four 20-year preliminary accords had been signed with unnamed “state-owned and private LNG buyers in Southeast Asia and China” for a volume of 3.1 MTPA. “Negotiations for definitive liquefaction tolling agreements and sale purchase agreements are ongoing,” the company said. “Phase 1 capacity was oversubscribed and Texas LNG was now marketing Phase 2 volumes,” it added. The project owners said a final investment decision was expected in 2018 and first LNG shipments in 2021-2022, in line with projected global market requirements. The Texas project headed by Chandra and Meyer is one of several proposed export projects located along the Brownsville Ship Channel. Of the current ventures, two others are also in the FERC process. They are Annova LNG with plans to produce 6 MTPA and the much larger Rio Grande project of former Shell executive Kathleen Eisbrenner targeting 27 MTPA of output. The Texas LNG venture is planning to build in two phases, each with production of 2 MTPA. It will include a single containment storage tank of 210,000 cubic metres and the LNG will be offloaded to conventional LNG tankers berthed at the site. Texas LNG submitted its request to initiate the FERC pre-filing process in March 2015. During the past 20 months, Texas LNG and its team of technical, environmental and legal advisers have completed some engineering work and submitted draft resource reports covering a wide range of areas. They have also engaged in extensive consultations with FERC and other federal and state

Diary of events

Gastech Conference and Exhibition
April 4-7, 2017
Makuhari Messe International
Convention Complex, Chiba City, Japan
www.gastechevent.com

LNG 2nd International Summit
April 24-25, 2017
Cannes, France
<http://lngsummit.org>

Flame Natural Gas & LNG Conference
May 8-11, 2017
Hotel Okura, Amsterdam,
The Netherlands
<https://energy.knect365.com/flame-conference>

agencies, including the US Fish and Wildlife Service, US Army Corps of Engineers, US Coast Guard and the Texas Commission on Environmental Quality. Texas LNG said it continued to believe that “smaller independent projects that promise low cost, low technical risks, and offer transparent, flexible tolling terms” will be best placed for development. The project was formerly wholly owned by Chandra and Meyer, who still hold the respective positions of Chief Executive and Chief Operating Officer. The shareholders now also include minority interests held by South Korean engineering group Samsung and several others, including an equity fund. Texas LNG asserted in its filing to the DoE that shale plays including the Haynesville, Eagle Ford and Barnett, as well as other pipeline natural gas sources, would provide adequate feed-gas for the venture. It said it would facilitate contractual arrangements between LNG purchasers and natural gas suppliers, including exploration companies, pipeline companies, and natural gas traders. Texas LNG has stated that feed-gas for the project would be transported to the site boundary via a 150-mile pipeline, originating at the Agua Dulce Hub located near Corpus Christi, Texas.

WILLIAMS Partners, the US pipeline company, has crossed a key regulatory hurdle with its Atlantic Sunrise project to link the abundant Marcellus shale-gas supplies with markets in the Mid-Atlantic and Southeastern US, including the future network of LNG export plants. Williams said that once complete, the Atlantic Sunrise expansion will help alleviate infrastructure bottlenecks in Pennsylvania, connecting the Marcellus shale plays. The expansion is set to cost almost \$3 billion in building out the existing Transco natural gas pipeline. The existing Transco pipeline company is a subsidiary of Williams and is the nation’s largest and fastest-growing interstate transmission system. It delivers natural gas to customers through its 10,200-mile pipeline network whose mainline extends nearly 1,800 miles between New York City and South Texas. “The system provides cost-effective natural gas services to US markets in the Southeast and Atlantic seaboard states, including major metropolitan areas in New York, New Jersey and Pennsylvania, as well as international markets,” said Williams. The Federal Energy Regulatory Commission published its final environmental impact statement for the proposed project,

concluding that environmental impacts would be reduced to “less than significant levels” with the implementation of mitigation measures. These mainline facilities will create a much-needed path from the northern part of the Transco system to markets along the Eastern Seaboard for a portion of the project capacity in time for the 2017-2018 US heating season. Construction on the Central Penn Line, the greenfield portion of the project, is targeted to begin early in the 3rd Quarter of 2017, which would allow for those facilities to be placed into service in mid-2018. This would allow more natural gas to be directed south to domestic customers and as feed-gas as more LNG processing Trains come on stream on the Gulf Coast. Engineering designs will increase deliveries by 1.7 billion cubic feet per day, the equivalent amount of natural gas to provide service to seven million homes. Williams said its net investment in the Atlantic Sunrise project is expected to be around \$1.9Bln. “The final Environmental Impact Statement underscores our collaborative efforts to design the Atlantic Sunrise project in a manner that minimizes environmental impacts,” said Rory Miller, senior vice president of Williams Partners’ Atlantic-Gulf operating area. He explained that new pipeline would connect customers “all along the East Coast with abundant, cost-effective Pennsylvania natural gas supplies” via the existing Transco pipeline infrastructure. The FERC report assesses the potential environmental effects of the construction and operation of the project in accordance with the requirements of the National Environmental Policy Act. “The FERC action is a key step toward the Commission’s final decision on the project, which is expected in early 2017,” said Williams.

WOODSIDE Petroleum, the Australian operator of liquefied natural gas plants, reported record fourth-quarter production and also said commissioning had started at the Wheatstone LNG joint venture onshore Western Australia where it is a stakeholder. “The Wheatstone project is approaching LNG Train 1 construction completion, all modules are on-site and final hook-up and commissioning has commenced,” said Woodside Chief Executive Peter Coleman in Woodside’s fourth-quarter earnings report. “The First LNG from Train 1 is expected in mid-2017 and from Train 2 six to eight months later,” said Woodside.

“All Train 1 and Train 2 modules are set on their foundations. Installation of piping, electrical and instrumentation continues as planned,” it added. “The storage and loading system is ready for commissioning and cool-down, with the LNG storage tanks and export loading jetty now complete,” the company said. Woodside operates the Northwest Shelf and Pluto LNG plants in Western Australia and the Wheatstone start-up will boost its volumes for export into Asia. The impending coming on stream of the Wheatstone plant will coincide with rising LNG prices. Woodside said higher realized prices reflected a strengthening of oil prices in the second half of 2016. Prices for the North West Shelf plant rose by 17 percent and by 4 percent at its single-Train Pluto LNG plant. Woodside said its NWS plant prices amounted to US\$6.20 per million British thermal units in December 2016 compared with \$5.30 per MMBtu three months earlier at the end of September. Its Pluto LNG prices were US\$8.40 per MMBtu in December compared with US\$8.10 per MMBtu in September. “We look forward to adding production from Wheatstone in the middle of this year. Wheatstone is a key component of our near-term growth strategy and will contribute more than 13 million barrels of oil equivalent in annual production once both Trains are fully operational,” added the Woodside CEO. Wheatstone is majority-owned by Chevron Corp., also operator of the Gorgon LNG plant on Barrow Island in Western Australia, and will have an initial capacity of 8.9 million tonnes per annum. The Wheatstone venture is located near Onslow, in the Pilbara region. The feed-gas comes from the Wheatstone, Iago, Julimar and Brunello gas fields. Woodside joined the project in 2015 when it completed the acquisition of 65 percent stakes in the Julimar and Brunello gas fields assets from Apache Corp of the US. “Woodside starts 2017 in a strong position,” stated Coleman. “Production performance has been outstanding, with the team consistently delivering world-class operational performance. LNG production system reliability has now exceeded 99 percent for a second consecutive quarter,” he added. Woodside said other highlights during the quarter included contracting five uncommitted LNG cargoes under a mid-term sales agreement. The Australian company also secured drilling equipment and services at competitive rates for 2017 drilling campaigns offshore

Myanmar and in West Africa, offshore Senegal.

ZEEBRUGGE LNG terminal in Belgium has recorded the first lifting of a cargo from its new second jetty by the small-scale Dutch-owned LNG carrier, the “Coral Energy” with 15,000 cubic metres capacity as the facility also prepares for providing bunkering services. The jetty was commissioned last month and is designed to receive the smallest LNG carriers with a capacity of 2,000 cubic metres up to some of the largest LNG vessels, the 217,000 cubic metres capacity Qatari Q-Flex ships. “Some 200 loadings have already been booked at the second jetty for small LNG carriers under long-term contracts,” said Zeebrugge operator Fluxys Belgium. “The second jetty also enables the terminal to respond flexibly to demand for simultaneous or quickly successive berthings as using both jetties allows two LNG carriers to be unloaded or loaded at the same time”, said Fluxys. The “Coral Energy”, owned by shipping line Anthony Veder, supplies mainly small terminals in northwest Europe in countries such as Finland Norway and Sweden. “With the second jetty able to accommodate the smallest ships, LNG bunkering vessels can now also berth at the terminal,” said Fluxys. “Until now, this could only be done using LNG trailers which come to load at the terminal but are not ideal for supplying seagoing vessels due to their limited capacity,” added the company. LNG is becoming increasingly important as a marine fuel because of cleaner combustion compared with heavy fuel oil and amid stringent sulphur emission regulations brought into force in the English Channel, the North Sea and the Baltic Sea, as well as other regions of the world. Shipping company United European Car Carriers, a leading provider of short sea roll-on-roll-off transportation, recently began operating its first LNG-powered car carrier in Zeebrugge, with a second to follow soon. The UECC ships will be refuelled with LNG by a purpose-built LNG bunkering vessel which will have Zeebrugge as its home port and in which parent company Fluxys is a partner along with French energy company Engie, Japan’s Mitsubishi Corp. and Japanese shipping company NYK Line. “There are currently around 40 ships under construction for use in the English Channel, the North Sea or the Baltic Sea, half of which will run on LNG,” Fluxys noted. ■



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Chile relates experience in entering LNG import market with GNL Quintero terminal

Rafael Gonzalez, Development Manager, and Alejandro Palma, General Manager, Chile LNG in Santiago

After the shortages of Argentinian natural gas imports in the 2000s, three Chilean companies, one state-owned and two privately-held, built the first LNG import terminal in South America.

It considered a very particular business model comprising two companies: a Terminal Company (GNL Quintero) that owns and operates the LNG terminal, and a Marketing Company (GNL Chile) that has all the capacity contracted through a Terminal Use Agreement (TUA).

Off-takers

It also sells natural gas to off-takers pursuant to long-term Gas sales Agreements and buys LNG from suppliers through Sales and purchase Agreements. Each SPA is directly related to a specific off-taker.

After almost 6 years of operation, this business model has proven successful and could be replicated in other multiuser terminals.

As is standard in the LNG industry, before the beginning of each contract year an Annual Delivery Program (ADP) is agreed. Following the scheduling rules of the SPAs and GSAs, the Marketing Company consolidates supply and demand, and negotiates with suppliers and off-takers to build an ADP globally optimized.

As a result of the ADP, each off-taker has rights to take natural gas from different SPAs, and not only from the one related to it. Therefore, borrow and lending (B&L) is produced.

In this business model, off-takers pay the Marketing Company a tolling fee plus a pass through of the LNG price.

To limit the exposure of the system, agreements between the off-taker and the correspondent LNG Supplier are in place, and the relevant parties are bound by the same arbitration rules.

History

The origins of GNL Chile go back to 2004, when the Government of Chile launched a public invitation to all large scale natural gas consumers in the central region, under the leadership of the state owned company ENAP (which in English

states for National Petroleum Company), to take part in the development of the Quintero LNG Terminal.

In response to that call, two private companies (Endesa and Metrogas) joined ENAP as the sponsors of the project. As the result of an international tender BG Group was selected for developing the receiving terminal and the long term LNG Supply.

As the need for natural gas was urgent, the project began under fast-track operation in 2009. During construction of the storage tanks, the regasifiers operate receiving the LNG directly from a moored standard LNG vessel, which remained docked for periods close to 20 days.

A small LNG storage Tank (10,000 cubic meters of useful capacity) was used as a buffer to maintain the LNG supply while switching cargoes, as the pier only has one berth. The operation is similar to an FSRU, but using inland regasification and standard vessels instead of regasifiers in the ship.

Following the period of fast-track operation, in 2011 the Quintero LNG Terminal achieved its commercial operation date, with a send-out capacity of approximately 2.5 MTPA and two large storage tanks (150,000 cubic metres each of capacity), in addition to the small one.

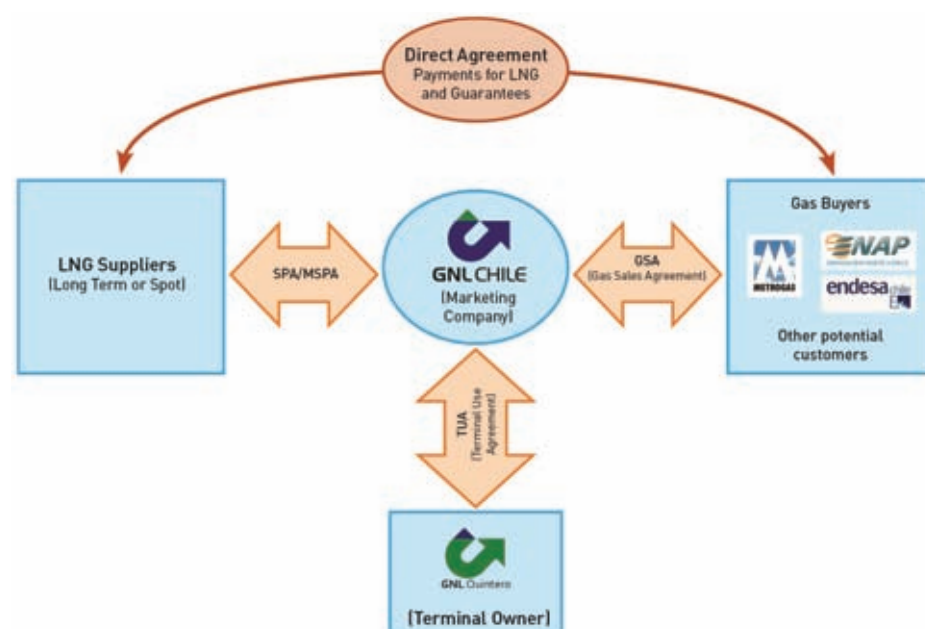
Open season

Also, in 2011 GNLC launched an open season or request for proposal process, offering an available capacity of 2.7 MMm3/d (99,644 MMBtu/d) from the first expansion project.

The process involved a public and international invitation and was based on best market practices, enabling any person to enter into a New GSA with GNLC.

The process drew significant market attention from local and international players, but it concluded with no binding offers from proponents.

After the open season, the existing customers decided to contract the available capacity from the first expansion, which included increasing the send-out capacity of 3.75 MTPA maintaining 310,000 cubic metres of storage capacity.



Structure of the first LNG import terminal developed in South America

In 2014, GNL Chile launched a second open season linked to an expansion plan to complete 5 MTPA and 450,000 cubic metres of storage capacity.

As part of this process, two companies (Colbún and AES Gener) were allocated with regasification capacity, and are waiting for the FID that is expected to take place in the second semester of 2016.

Demand zone

The central zone of Chile concentrates more than 80 percent of the natural gas demand in Chile. Such demand is supplied by GNL Chile's natural gas.

Marketing company and business model: From the early stages of the project, the sponsors realized that the market reality in Chile was not very standard in the LNG Market, and thus it may require a particular business model to address the challenges of a project of this kind (different from a standard tolling model).

In the first place, the number of expected off-takers was in the range of three to five. At the same time, because of relatively small size of the off-takers, and the high expected costs of the storage tanks (which shall have a seismic design), the storage needed to be shared and therefore an important amount of borrowing and lending was required.

On top of that, the central zone of Chile was going to be supplied only by this terminal, which means that security of supply was critical.

Given that scenario, the sponsors, together with BG Group at the time (now part of Shell), opted for a Business Model that comprises two companies:

- **Terminal Company:** A company that will own and operate the terminal facilities in Quintero. That company should structure the project finance for the terminal.

- **Marketing Company:** A company that will contract 100 percent of the storage and regasification capacity of the terminal. That company will be responsible of the LNG purchasing and contracting in the international markets, using the facilities of the Terminal Company. The Marketing Company owns the LNG while it's in the terminal and delivers natural gas to the off-takers.

Contractually, the Marketing Company has a Terminal Use Agreement (TUA) with the Terminal Company.

At the same time, the Marketing Company has Sales and Purchase Agreements (SPAs) with LNG suppliers and Gas Sales Agreement (GSAs) with the off-takers.

In traditional business models for multiuser terminals, each user has a TUA with the Terminal, containing the rights to use storage and regasification capacity. Therefore, each user can buy directly the LNG from LNG Suppliers or bring its own cargoes.

As in other multi-users terminals, the Marketing Company business model has to consider a serious of key matters for an

effective operation and for keeping the risks of the project properly allocated. Among them, there are:

- ADP programming, both with LNG Suppliers and with Off-takers.
- Mechanisms and rules for cancellations, spot purchases, or other modifications of the annual program.
- Nominations procedures
- Indicators to avoid over stock or lack of inventory, together with definition of responsibilities and penalties for not performing according to those indicators.
- Allocation of deficiencies in LNG supply, regas capacity or other situations that may affect normal operation of the terminal.
- Force Majeure conditions
- Rules for arbitration
- Minimum requirements for LNG SPAs
- Conditions and limits for B&L.
- Ways of limiting the exposure of the Marketing Company
- Tariff structure
- Allocations of system flexibilities, including the use of storage and regasification capacity from other off-takers when not being used.

There is no unique solution to address these matters. The following paragraphs outline the definitions taken by GNL Chile in some of these critical matters:

Arbitration rules

The Quintero terminal uses one single arbitration agreement that applies to all off-takers, long-term LNG suppliers, the Terminal Company and the Marketing Company, under the arbitration rules of the ICC (International Chamber of Commerce).

This agreement is designed to allow new off-takers and new long-term LNG suppliers to accede to this agreement becoming party of it.

GNL Chile cannot enter a new GSA or long term SPA with a party that has not acceded it (except for short term suppliers (Spot) who are not bound by this rule). The arbitration agreement allows consolidation of related disputes and achieves consistency in the resolution of disputes.

‘Force Majeure’

In a multiuser terminal with extensive borrow & lending, the definition of a common ground for FM conditions simplifies the operation and minimizes the need for handling special cases when setting up the chain of “force majeure” conditions that involve all relevant

parties, from the LNG Supplier to the off-taker.

In the case of our project, the decision was to cover (additionally to the terminal and adverse weather conditions, which are the most standard) the main transport pipelines that deliver gas from the terminal to our customers, as an FM event affecting these pipelines will have the effect of impeding the flow of natural gas from the terminal.

Minimum requirements for LNG SPAs: As the Marketing Company is the counterparty for all SPAs, it is important to set up a group of rules in order to determine when a new SPA would be acceptable to the system.

Those rules contain a list of operational matters (like measurement conditions, quality requirements, programming rules, terminal conditions of use, etc.), but they also contain other rules including:

- As in the GSAs and TUA, the governing law in the SPAs is NY law.
- LNG supplier shall have Investment Grade (IG) credit rating, or have a Parent Guarantee from an IG entity. In the case of Non-Investment Grade spot suppliers, stand-by letter of credit from an IG bank can guarantee their performance.
- There is a mandatory minimum in claim damages if there is a failure to deliver LNG (responsibility of LNG supplier).

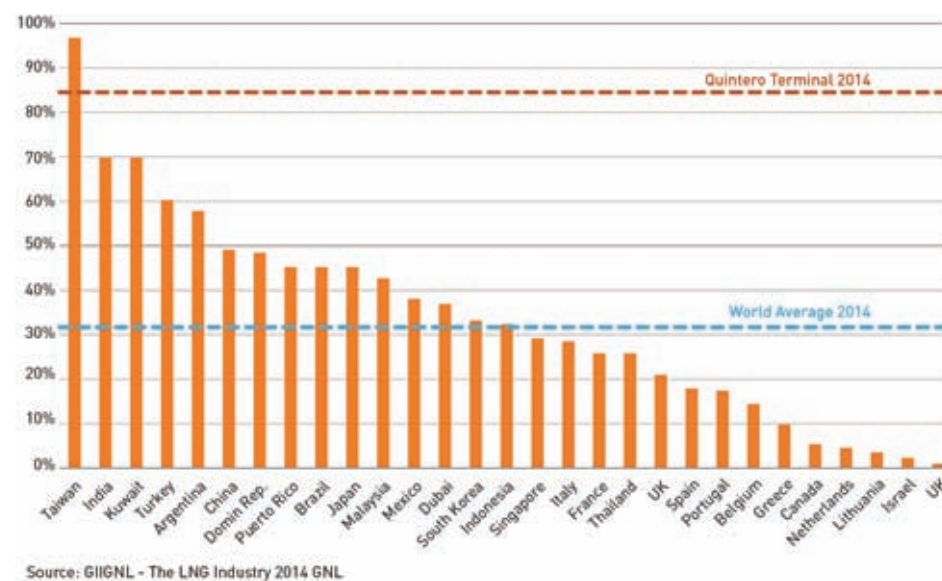
Limiting the exposure of the marketing company: As the Marketing Company is the company that supplies all the off-takers, and it is also the counterparty for all SPAs, it is important to keep it reasonably protected from the risk of default and litigation.

Otherwise, an off-taker may be affected if an LNG supplier (other than the one supplying the needs of such off-takers) seeks for remedies directly from the Marketing Company.

In the Quintero terminal this risk is addressed by using a separate agreement between the Off-taker and the LNG Supplier, called the “Direct Agreement”. This contract contains provisions that basically state the following:

- All payments to be made pursuant to an SPA are done directly by the off-taker to the LNG Supplier.
- In case of non-payment under the SPA, the LNG Supplier shall seek for payment and remedies directly from the Off-taker, and not the Marketing Company.

One important principle for this is that



Utilization rates of world LNG terminals versus Quintero facility

each SPA is linked directly to one specific off-taker. That off-taker has to assume, through the Direct Agreement, all economic responsibilities contained in the SPA, including the effects of a failure to pay.

Additional to the direct payments to LNG Suppliers, each off-taker pays a tolling fee for terminalling and marketing services. Thus in terms of payments and financial risk, the Marketing Company business model is very similar to a standard business models where the off-taker has a TUA with the terminal.

Borrowing and lending in the marketing business model: Many multiuser terminals have in-tank B&L schemes, particularly when the storage space is limited. This means, that if two or more off-takers of a single terminal are receiving LNG from different suppliers, they can share the space in the tanks and the stored LNG to increase the efficiency of the system.

To better understand the benefits of B&L, we can think of a terminal with one storage tank (than can store one cargo lot) and two off-takers (A and B) with a demand that is more or less constant throughout the year.

If there's no B&L, each one will have to take natural gas after the arrival of its cargo, fast enough to allow the discharge of the next cargo programmed.

If the cargo of A arrives first, then off-taker A will be able to take natural gas while B will have no right to receive gas. After A has taken all the LNG from the tanks, the cargo of B will be able to unload LNG, allowing B to take natural gas while A will have to wait for the arrival of the next cargo.

In the same system, if it is designed to use B&L, off-taker B will be able to take natural gas from off-taker's A cargo. Then, when the off-taker B receives a cargo, he

will return the borrowed volumes.

In this example, while without B&L both off-takers were forced to take natural gas in intermittent batches, with B&L they took natural gas constantly through the year according to each off-taker's actual needs.

More tanks

In a larger terminal, we can see that a terminal with two tanks of 165,000 cubic metres capacity that uses B&L is equivalent to a terminal with three tanks of 175,000 cubic metres capacity that doesn't use B&L.

Though the benefits look clear in the example above, terminals that use B&L need to take care of some issues.

One of them is the need to check that even if there is borrow and lending, in the long term each off-taker should be able to take all the LNG he is bringing. Therefore, at some point (maybe at the end of the year) A and B may need to define a way to resolve any difference.

Other important thing is that at some point of the year, A or B may need to provide some securities to the other off-taker (when they are being borrowers), and they may also need to define some limits in the amount that each one can borrow or lend, so that the exposure that each off-taker has is limited.

While the B&L mentioned is developed in traditional business models, a B&L system with a Marketing Company takes one step further.

Entitlement

Instead of having in the storage tanks an inventory of LNG owned (directly or borrowed) by the off-takers, in our project the Marketing Company owns all the LNG. Nevertheless, the 100 percent of such LNG gives entitlement rights to each off-taker.

The B&L in the model of the Quintero terminal is annually based. This means that the aggregated entitlements for any off-taker during one contract year, matches the volumes of LNG that will be received by such off-taker's SPAs.

This leads naturally to a B&L system, as the Marketing Company can choose how to supply each off-taker needs with any LNG supply contract, as long as the annual balance is preserved.

The final result of both approaches can be seen as quite similar, as in both cases the off-takers share their SPAs to reach a position where the storage is used more efficiently. Nevertheless, there are some differences that is worth mentioning:

- **Guarantees between off-takers:** The purpose of having guarantees between the off-takers in traditional models (where the off-taker is the counterparty of the SPA), is to cover the risk that a borrower will not return the corresponding volumes as committed, because of reasons that may include that the cargo was cancelled by the off-taker, LNG was off-spec, or other reasons permitted by the SPA. In the Marketing Company model, where the counterparty is the Marketing Company, cancellations of cargoes can only be without affecting the rights of other off-takers, and conditions like off-spec conditions and treatment are standardized between all SPAs. Therefore, guarantees are not needed.

- **Master Agreements (MSPAs):** In traditional models, each off-taker shall negotiate and have its own Master Agreements, which may be good for large utilities, but it is a complex scenario for small or medium size companies. With the Marketing Company model, one MSPA with one supplier can be used by all off-takers. Moreover, a spot cargo can be bought by more than one off-taker that have individual needs that are smaller than a cargo, but can be combined into a full cargo lot with another off-taker.

- **Shared Services:** Many activities

related to the purchase of LNG can be managed together in a more efficient way. These activities include business intelligence, import and customs related activities, reaching agreements that need the consent of several off-takers, negotiating and maintaining the relationship with long term LNG suppliers, media and government relationship, etc. A Marketing Company can engage in some or all of these activities.

The Annual Delivery Program (ADP) and building the ADP: The Annual Delivery Program is the standard procedure in an SPA to define the arrival of cargoes for the following contract year. In addition, natural gas off-take rights may be constructed from such a program.

With the Marketing Company business model, the requirements of all the off-takers and the SPAs are integrated and aggregated through the Marketing Company.

Therefore, the Marketing Company can seek for a global optimum to supply the needs of all off-takers.

During the ADP building process, the Marketing Company can also centralize negotiations with all LNG Suppliers and the off-takers, seeking for adjustments in supply and demand that would lead to a program that works for all parties.

Windows

In the Quintero terminal, this process is done between 140 and 85 days before the beginning of each year.

As a result of the process, an annual program is defined containing the arrival windows for all cargoes and the programmed demand of all off-takers.

The programmed demand of the ADP generates the Gas Entitlement (GE), which defines how much of the LNG inventory can be taken by each off-taker.

Following certain rules, the program can be adjusted at any time afterwards. These modifications include changing the arrival window of certain cargoes,

adjusting the programmed demand of an off-taker, and adding or cancelling cargoes in the program.

The basic underlying rule for these changes is that the adjustments requested by a party cannot affect the rights of the other parties, unless such party consents to the adjustment.

After seven years of operations, the model has proven successful, and could be replicated in other import terminals.

The Quintero terminal is one of the most utilized terminals in the world. The main reason for this is that central Chile has been affected by a long draught that has limited the hydro electricity production, raising the need for thermal power including gas-fired power plants.

The model responded very well in this very stressed situation, supplying directly its customers Enap, Endesa and Metrogas, and indirectly (through the secondary market) to the power generators Colbún and AES Gener.

The second expansion operation is also due to be completed in 2021.

Conclusions

The Marketing Company business model used in the Quintero Terminal has proven

to be an interesting innovation that has provided several benefits to the off-takers in Chile.

This model could be used in other receiving terminals, particularly in multiuser terminals with relatively small sized customers that need to share storage tanks using B&L. This model responds well even in situations when terminal usage is high.

The Marketing Company is an extra layer between the off-taker and the LNG supplier. This could be seen as a benefit for some parties that may not want to get involved in the day-by-day operation and relation with the terminal operator or LNG suppliers, and could delegate such responsibilities and tasks to a third party.

Nevertheless, other parties may be more interested in being directly involved in the LNG business and in the relationship with the terminal operator, in which case other models would better serve that purpose. ■

This article is based on a conference presentation from a paper entitled: "GNL Chile: Experience and business model" by Rafael Gonzalez, Development Manager, and Alejandro Palma, General Manager, GNL Chile in Santiago.

References:

1. La Tercera (www.latercera.cl), Dec 18th, 2015, Colbún y AES Gener confirman solicitud de uso de GNL.
2. Philip R. Weems, Lisa M. Tonery, Gavin B. Watson. LNG Import Terminals - Challenges and Opportunities - King and Spalding.
3. Joost Smits, The impact of a good inventory management policy, white paper,
4. GIIGNL, The LNG annual report (2014), tables "Quantities (in 106 T) received in 2014 by the importing countries from the exporting countries" and "Regasification Terminals at the end of 2014".



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Cove Point in Maryland is transformed into main exporting plant on US Atlantic coast

Construction and engineering companies as well as equipment suppliers open export path for terminal

Dominion Cove Point LNG is integrating a single natural gas liquefaction train of 5.25 million tonnes per annum of production capacity into its existing import facility, which has send out capacity of 18.7 billion cubic metres a year and 690,000 cubic metres of storage capacity.

The Cove Point LNG facility is located in Maryland. Innovative design features are necessary to meet stringent local, state, and federal environmental and regulatory requirements.

Features

The design addresses these challenges by using new technologies and process features, many of which have not previously been implemented in the LNG industry.

Key features of the new facilities are: a feed gas recycling system to minimize the potential for flaring during start-up; all refrigerant compressor services included on each of two identical parallel strings; a new main cryogenic heat exchanger cool down procedure; a highly efficient islanded power generation system that uses exhaust heat from the gas turbine compressor drivers, and zero liquid discharge processing facilities.

These unique design features also provide needed flexibility for facility operations, all within the confines of the existing terminal, which will remain in service as an import facility throughout the liquefaction integration.

The challenges associated with implementing the new technical concepts were met through close cooperation among all involved parties; including the design and project management team, LNG import operations team, facility owner, technology licensor, and major equipment suppliers.

The existing Dominion Cove Point LNG import terminal was commissioned in 1978 with a send-out capacity of 10.4 Bcm a year and LNG storage volume of 238,000 cubic metres. Additional send-out capacity and storage were added in several stages to bring the current capacity to 18.7 Bcm/y and LNG storage to 690,000 cubic metres, with the latest expansion occurring in 2008.

In September 2011, Dominion began the lengthy application processes seeking to export LNG first to countries that have Free Trade Agreements (FTA) with the United States and then to non-FTA countries.

In June of 2012, Dominion submitted a request to initiate the pre-filing process with the Federal Energy Regulatory Commission (FERC) for a liquefaction project at Cove Point.

In September 2013, approval was received from the U.S. Department of Energy for natural gas exports to non-FTA countries.

In April 2013, Dominion filed an application with the FERC, seeking authorization for the Cove Point liquefaction project and also contracted with IHI/Kiewit for engineering and construction services.

FERC approved the application in September 2014. Construction activities began at the facility in October 2014.

Builders

IHI/Kiewit Cove Point, a joint venture between IHI E&C International Corporation of Houston, Texas and Kiewit Corporation of Omaha, Nebraska, is the engineering, procurement, and construction contractor for the new liquefaction facilities.

The liquefaction technology used is the Air Products AP-C3MRTM process. Refrigeration compressors and gas turbine drivers are provided by GE Oil & Gas.

Mercury Removal. The Mercury Removal Unit is located directly downstream of feed gas receiving, thus preventing mercury from entering any of the downstream units.

Acid Gas Removal. Acid gases are removed using a diglycol amine (DGA) solution. Due to engineering constraints the unit contains two parallel absorbers instead of one larger absorber. The unit includes an amine reclaimer to remove heat-stable salts and other heavy contaminants. An antioxidant is injected into the DGA solution to negate the effects of up to 200 ppmv oxygen that may be present in the feed gas. Hydrogen sulfide in the acid gas leaving the amine regenerator is removed by scavenging

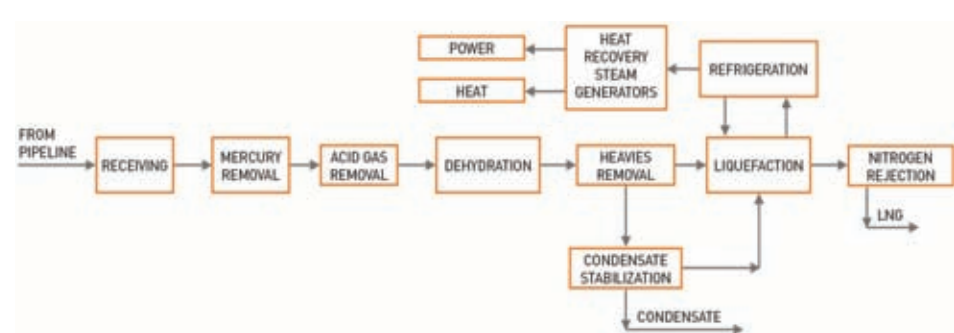


Figure 1: Plant process flow scheme for Dominion's export facility

upstream of a thermal oxidizer, minimizing both H₂S and SO_x emissions.

Gas Dehydration. Gas dehydration uses molecular sieves with a unique closed loop regeneration system to enable processing of feed gas with as much as 200 ppmv oxygen. Normally a slip stream of dried feed gas is used for dryer bed regeneration. However, oxygen in the regeneration gas could react with adsorbed heavy hydrocarbons and foul the sieve. For Cove Point the closed regeneration loop reduces oxygen in the regeneration gas to prevent this fouling.

The closed loop includes a separate regeneration gas dryer and a regeneration gas compressor. Oxygen in the closed loop combusts some regeneration gas after it is heated in the regeneration gas heater to produce water and CO₂.

Separator

The bulk water removed from a regenerating main bed is condensed in the regeneration gas cooler and knocked out in a separator.

The remaining water and CO₂ are adsorbed on the regeneration gas dryer bed, from which the dry gas flows back to the main bed.

The regeneration gas dryer is regenerated between main dryer cycles. CO₂ is prevented from building up in the closed regeneration loop by occasionally purging some gas to the fuel system.

Refrigeration Unit. The refrigerant compression and driver configuration is new for LNG plants using the AP-C3-MRTM process. It is comprised of two identical compressor/driver strings. Each of the two strings includes propane, LP MR, and MP/HP MR compressors; with Frame 7EA gas turbine and helper motor drivers located at opposite ends.

The plant can operate at reduced capacity with only one string online, which increases the overall plant on-stream time and reduces the potential for flaring incidents.

The typical refrigerant compressor arrangement currently applied uses two strings with different services on each, so that both must operate to produce LNG.

For the Dominion facility, the low pressure mixed refrigerant (LP MR) compressor is a horizontally split casing (MCL1405) and the medium/high pressure MR (MP/HP MR) compressor is a back to back barrel compressor (2BCL806).

The propane (PR) compressor is a single horizontally split casing with 3 side-streams.

The compressors designs were tuned to minimize load sharing control issues during normal and transient operations, focusing specifically on performance prediction to limit performance variability between machines.

Very tight tolerances on specifications for head, efficiency, and curve shape at minimum and maximum flow will permit stable operation at any flow within the operating envelope, thus preventing significant differences in loadings between the two parallel strings.

Identical

Whenever possible, an impeller identical to one proven by testing has been used. The Dominion compressor impellers are similar to existing designs in operating facilities.

The LP MR compressors have been equipped with a recently improved design for high Mach/ high flow impellers. These impellers have increased efficiency and higher head rise to surge compared to previous impeller generations.

Gas Turbine Exhaust Heat Recovery: Heat Recovery Steam Generators (HRSG) on both turbine exhausts produce superheated high-pressure steam (SHP) for power generation and process uses, reducing fuel demand for these services and also producing less greenhouse gas. Start-up and supplemental SHP is provided by auxiliary boilers.

The gas turbines have dry low emissions (DLE) burners and their exhausts pass through selective catalytic reduction units (SCRs) to bring NOx emission to levels required by the environmental permit. The CO concentration in the exhaust gas is lowered by catalytic oxidation.

The Auxiliary Boilers and Thermal Oxidizer also utilize SCRs and CO oxidation units to further minimize emissions.

Innovative concepts

Combined Pre-Cool Down and Final Cool

Down: The Dominion Cove Point liquefaction project incorporates a procedure to recycle gas during start-ups, to minimize potential flaring that typically occurs when cooling down equipment to cryogenic temperatures. This innovative procedure maintains the initial cooling rate for the Main Cryogenic Heat Exchanger (MCHE) below the prescribed maximum limit.

The procedure begins with one refrigerant compressor string operating in recycle mode and natural gas in the MR circuit. To initiate cooling, gas from the MR compressors is circulated through the liquefaction equipment.

Pressure reductions across both the light and heavy MR J-T valves cool both MR streams. The two streams flow into the shell of the MCHE and simultaneously cool the shell and bundles.

Addition

Propane liquid is then added to the MR/propane and feed gas/propane evaporators in a staged manner.

Feed gas flow is introduced at the appropriate time. The cooled feed exits the top of the MCHE and is diverted to a unique Start-Up LNG Vaporizer.

This vaporizer is capable of vaporizing enough LNG to start the plant on full recycle. (Initially, the gas stream from the MCHE is still relatively warm and will need only limited heating, if any, but as the MCHE is cooled, the vaporization duty increases.)

After passing through the vaporizer,

the gas is routed to the suction of the Lean Gas Booster Compressor, which had previously been placed into recycle operation. This enables the gas used in cool down to be recycled and recovered.

Recovery Systems for Liquids and Vapors: The Cove Point liquefaction plant is designed with systems to minimize the need to flare various streams that, in the past, have not normally been recovered.

- A Propane Recovery Compressor is used to reduce the pressure on the Propane Compressor prior to start-ups, thus eliminating the need to depressurize propane to the flare.
- Seal buffer gases vented from all compressors are sent to a dedicated Low Pressure (LP) Vent Collection System that connects to the plant's boil-off gas recovery system. This system also collects vents from online analysers.
- Liquid MR drained from the MR Separator and other locations is sent to the Refrigerant Recovery Drum. This drum vents light components into the LP Vent Collection System, while liquids recovered are recycled back to the MR Separator for reuse, or to the LNG Drain Drum. The LNG Drain Drum has a heater that vaporizes the liquid into the BOG header.

Zero Liquid Discharge. Waste water from the plant includes boiler blowdown water and brine rejected from the demineralizers that supply makeup water to the amine unit and for boiler feed water makeup. These streams are collected and concentrated in a crystallizer. Solids from the crystallizer are fed to a pressure filter that produces wet solids and a concentrated filtrate. The solids are accumulated and loaded onto trucks for transport to an approved disposal facility.

Water from the concentration process is vaporized, condensed, and recycled to the demineralizers. Thus there are no process waste water discharges from the plant.

Water knocked out during regeneration of the dehydration beds is recycled back to the amine unit. Any heavy contaminants present in the recycle water will be removed with the waste stream from the amine reclaimer.

Noise Mitigation. Buildings, equipment and pipes are acoustically insulated and a 60 ft. (18.3 meters) high wall is being installed around much of the liquefaction plant to meet standards for noise transmission outside the plant boundaries.

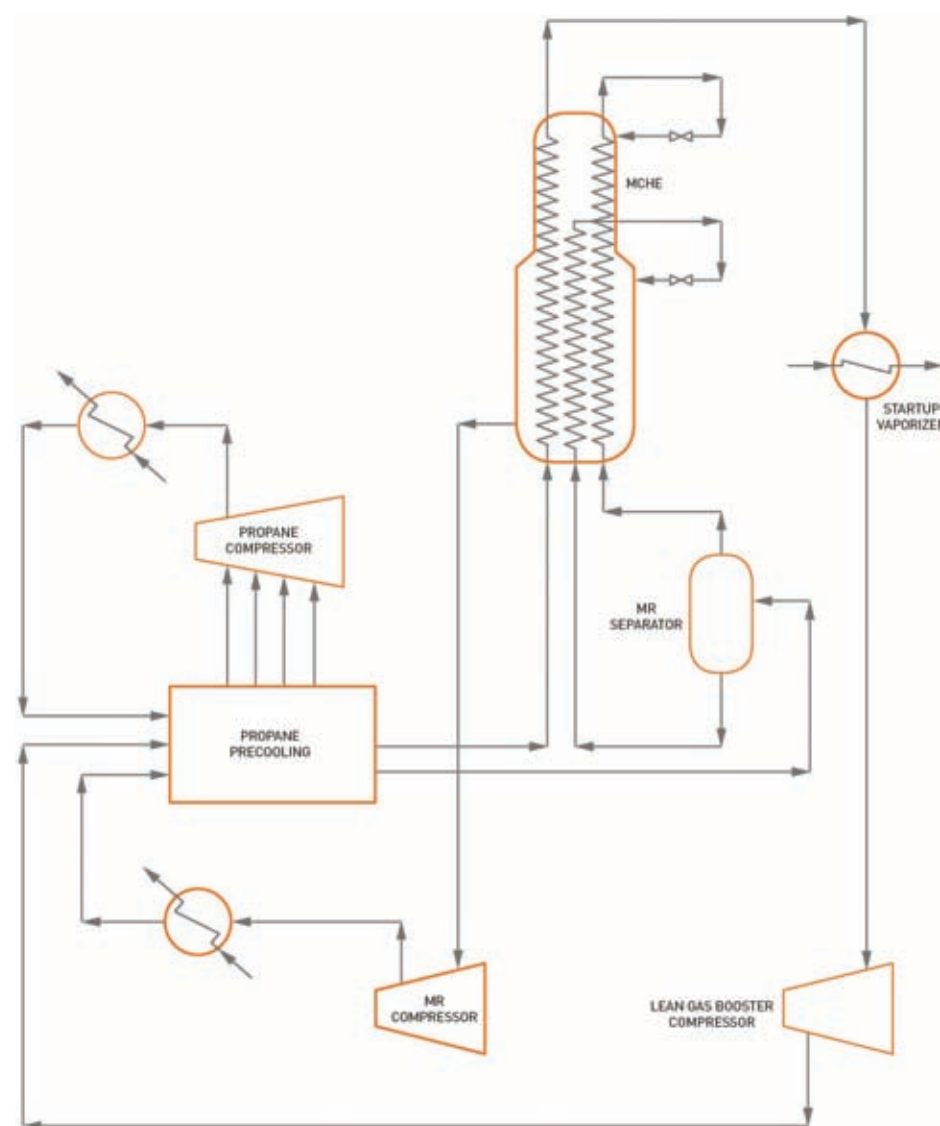


Figure 2: Cool down circulation loop at the Maryland plant

Height Restrictions. Another condition for the liquefaction plant required that no equipment could be higher than the tallest existing equipment at the facility. This affected the design of the MCHE and the flares.

The MCHE height limit was met by making the exchanger a two bundle design. This was facilitated by the upstream location of the Heavies Removal Unit. Since mixed refrigerant cooling is not required for heavies removal, a third bundle is not needed.

Ground flares are provided so that flare stacks and flames are not visible outside the facility.

Compressor string performance and response to upsets: Detailed performance tuning was conducted during the design phase to minimize differences between expected and as-tested characteristics.

First, the actual flow path from CAD models was used to compare 2D performance analyses to performance prediction tool results. A second step was CFD (Computational Fluid Dynamics) analysis of compressor impeller and stator components.

Results from these two steps have been used to tune flow path geometries to match or improve expected efficiencies,

operating ranges, and performance curves shapes.

Strings

ASME PTC10 Type II tests have fully confirmed the agreement between expected and tested performance with negligible string to string differences.

The new string arrangement required a very long shaft. To reduce compressor footprint without comprising performance, flat end casing designs were used for horizontally split compressors.

They have a very compact shaft design accommodating the inlet plenum and discharge scroll just above the shaft ends, minimizing bearing span.

Dynamic Simulation of Parallel Compressor Strings. With the aim of optimizing parallel string operability, a rigorous dynamic simulation was performed in two phases.

In Phase 1, a detailed model of the compression system was developed to study additional protection for compressor surge prevention, driver capability during start up, and to design and size process valves. HYSYS software was used to develop a dynamic model of the PR and MR compression systems.

Scenarios analyzed in Phase 1 were

the Emergency Shutdown (ESD) of one string and the start up from zero speed to Minimum Operating Speed (MOS) to verify driver capability. The ESD analysis is critical due to the parallel train configuration.

The results showed that in order to mitigate surge and prevent counter-rotation, additional valves were needed. Three PR and one MR Hot Gas Bypass Valves (HGBVs) in addition to fast-closing Suction Isolation Valves were added.

The start-up analysis is critical because the PR and MR compression system cannot be started from the settle out pressure. The systems have to be partially depressurized in order to allow the Frame 7EA and helper motor to accelerate the string to MOS.

In Phase 2, an advanced dynamic model of the parallel strings was linked to the actual compressor control system being supplied by Compressor Controls Corporation.

Mitigation

This study allowed mitigation of potential operability issues, control system testing,

and controller pre-tuning, which will benefit commissioning activities. Several scenarios were analysed in Phase 2 with particular attention given to the response of a single string trip when both strings were online. Due to the parallel string configuration, the trip of one string generates a refrigeration system disturbance which tends to overload the still running string.

If no actions are taken, the operating string may trip due to GT under-speed. The dynamic simulation showed that a trip of the remaining string could be prevented by partially closing the LP MR suction throttling valve and increasing the gas turbine speed to Maximum Continuous Speed (MCS).

These changes must be maintained until the disturbance dampens out.

The process licensor also performed dynamic simulations of the impact of various upsets on the overall liquefaction process. These simulations included:

- Loss of 1 of 2 refrigeration strings and transition to reduced LNG production
- The subsequent restart of a refrigeration string while its

companion string is online followed by the transition to full production. Technical information was exchanged to align the separate dynamic simulation efforts and reach a consensus between the parties.

Conclusions

The Dominion Cove Point project required innovative design features to meet all environmental and regulatory requirements. These challenges were addressed by using new technologies and process features, many of which are implemented for the first time in the LNG industry:

- Recycling feed gas during start-up to minimize the potential for flaring
- Parallel refrigeration compressor strings using industrial drivers in the AP-C3MRTM process
- New main cryogenic heat exchanger cool down procedure
- Closed loop feed gas dehydration system
- Highly efficient islanded power generation system that uses exhaust heat from the gas turbine compressor drivers

- Zero liquid discharge processing facilities.

These requirements are all met within the confines of the existing terminal, which will remain in service throughout the liquefaction integration.

Meeting all of these challenges required close cooperation among all associated parties; including the design and project management team, owner, technology licensor, and major equipment suppliers. The design has been completed and the facility is under construction leading to an anticipated on-stream date of late 2017. ■

This article is based on a conference presentation entitled: "Converting Cove Point in a bidirectional facility" by Pascal Bocherel, Jim Strohmman and Juan Martinez, Dominion Cove Point LNG, Brett Wink, Kamal Shah and John Ray, IHI E&C International Corp., Russell Thompson of Russell McLandsborough and Kiewit Engineering & Design Co., Robin Pearsall and Erinn Stemetzki of Air Products and Lorenzo Gallinelli, Emiliano Toci of GE Oil & Gas

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Views and policies of leading global players in the LNG industry as seen from Japan

Considered view of Japanese government on what others say about the market and their plans going forward

Japan's influential Ministry of Economy, Trade and Industry has published a 20-page report summing up the latest views of the major players on the state and direction of the liquefied natural gas industry in 2017 and beyond.

The considered view of the METI comes after evaluations of the opinions and forecasts put forward at the LNG Producer-Consumer Conference held at the end of 2016 in Tokyo.

Here are the Top 20 views in alphabetical order of countries and companies:

Anadarko Petroleum (USA): The company is proceeding with an LNG project in Mozambique and is prepared to offer flexible pricing arrangements to prospective buyers. It considers East Africa as a strategic location in the LNG market.

Alaska: The US state is promoting monetization of its natural gas resources through streamlined regulatory and taxation frameworks for efficient upstream development. Alaska is a stable supply source in the region with a direct route to major Asian markets including Japan. Alaska has the ability and flexibility to offer innovative pricing terms and flexible conditions of contract. Alaska has low cost, proven conventional reserves and it offers value chain integration and investment opportunities, as well as complete elimination of destination clauses.

BP: As a portfolio player BP provides competitive LNG supply to its customers, having supplied Henry Hub and European price linked LNG to the Japanese market. BP is also making some counter-cyclical moves, including the final investment decision on Tangguh Train 3 in Indonesia and the offtake agreement with Coral Floating LNG offshore Mozambique.

Brunei: As LNG demand is expected to grow mainly in Asia and LNG supply is also expected to grow mainly from the United States and Australia, the market is in great transition. Brunei, as the first LNG producing country in the Western Pacific, has been a stable LNG supplier for more than 40 years, and is expected to be so for another 60 years

thanks to plant rejuvenation conducted in 2004.

Gas Authority of India: The government of India has an important role in expanding infrastructure. It is important to establish such regimes to encourage new entrants into the LNG business, such as third-party access to facilities.

Japan intends to lead the global LNG market reform through pursuit of the three pillars in its strategy: better tradability of LNG by easing destination restriction clauses, open and sufficient infrastructure with non-discriminatory third-party access to LNG-related facilities and establishing an LNG pricing index.

JERA Co Inc. (Japan): The most notable change in future LNG contract terms is increasing Henry Hub linked LNG supply. Pricing indices are expected to diversify with more use of the Japan-Korea Marker, rather than crude oil prices.

Myanmar: The nation is in a position of fundamental need to develop its industries and to improve people's living standards. Gas is most likely the best answer for Myanmar's long-term energy needs because of significant gas reservoirs in Myanmar and environmental friendliness. To fulfil the gas demand of gas for power and industry in the next five years, introduction of LNG is indispensable.

Novatek (Russia): We are constructing the Yamal LNG project, which is accompanied with huge gas reserves and has competitive production costs. The project is expected to achieve annual production capacity of 16.5 million tonnes in 2019. The company also plans another project, Arctic LNG, for which the company proceeds with a study to optimize investment costs.

Oxford Institute (UK): There are different aspects for LNG liquidity: judging from statistics of spot and short-term transactions, direct liquidity may not look huge. But there are hidden liquidity elements incorporated in recent more flexible contracts. Linkage between regional markets of Asia, North America and Europe and arbitrage opportunities



Falling LNG spot and oil prices led to change of Asian attitude

between these markets also provide indirect liquidity. Confidence among players built through the above elements also encourages flexibility of trade.

Papua New Guinea: PNG still has huge resource potential with three quarters of promising areas not having been explored yet. The country is open to overseas companies for resource development. The country continues promoting LNG project development, with its strategic locational advantage, close to Northeast Asian markets. PNG welcomes investors from outside of the country to entire gas value chain from upstream development, pipeline infrastructure, to downstream facilities including gas-fuelled power generation projects, with appropriate investment protection and supportive measures including simple licensing procedures and streamlined processes. Another LNG production project is planned with an FID set for the last quarter of 2018, targeting a start of production in 2022.

Pertamina (Indonesia): Due to increasing domestic gas demand, more Indonesian gas production is expected to be allocated to domestic consumption, rather than exports. LNG imports are also expected as a future option. The Indonesian domestic market is not really ready to make long-term purchase commitments, although demand and supply are certainly there for LNG. The country still lacks enough receiving facilities. Even without such restrictions domestic users are not ready to utilise LNG yet.

Petronas (Malaysia): Asia is expected to increase LNG imports prompted by environmental concerns, new technologies including FSRUs and decreasing domestic gas production, on the back of expanding population. Based on three core values of stable supply, supply flexibility and cooperation with buyers, Petronas is poised to offer its value proposition throughout the LNG chain in ensuring sustainability of the business. The first floating LNG production facility, Petronas FLNG is scheduled to start production in February 2017.

Philippines: Although natural gas demand in the Philippines mostly for power generation is supplied by the domestic gas field, the reserves will start to deplete in 2022. Thus, imports of LNG will be the only sure source of new gas in the medium-term. LNG imports are expected to commence in 2018 and 2 million tonnes of imports will be realized by 2024. Further potential demand of LNG will also come from the off-grid islands which are currently without transmission grids or pipelines.

Qatar: As the world's leading supplier Qatar like other LNG producers has faced falling prices, stagnating demand and rising global production capacity. Qatar is concerned about the impact of curtailed capital investment on future developments of gas resources that are necessary to sustain the long-term consumption growth and efforts to mitigate climate change. However, Qatar is optimistic about the future of LNG

considering huge demand potential underpinned by affordability and environmental friendliness. It is essential that producers, consumers and other stakeholders engage in a genuine cooperation and constructive dialogue to establish a stable LNG market and healthy business environment.

Royal Dutch Shell: Somebody has to assume risks to realise a new LNG project. Either developing companies should change their business models, or long-term commitments should be made by either end-use companies or between buyers and sellers.

Singapore: In today's international LNG market, there are three opportunities for growth: Firstly, creating new markets for LNG such as bunkering and small-scale LNG in Southeast Asia. Secondly, creating an LNG hub. Singapore is neither a significant LNG seller nor big buyer, making this price discovery platform comparatively neutral. Thirdly, developing LNG ecosystems. Promoting the transition from traditional fossil fuels to gas not only protects the

environment, but creates sustainable value in the lives of our people.

Taiwan: Natural gas has expanded its presence in recent years as a low-carbon energy in addition to renewable energy sources; this combination would lead Chinese Taipei towards a low-carbon society and a sustainable future. CPC Corp., as the sole LNG importer in Chinese Taipei, has diversified its LNG supply sources. The demand for LNG is expected to further increase on the back of the government measures to improve air quality. Given the rapid growth of gas demand, the company has attempted to expand tank capacity as well as to build a third LNG receiving terminal located in the northern region with annual receiving capacity of 6 million tonnes. CPC is committed to helping establish a more robust, flexible and liquid LNG market through three core values: affordable and reasonable price, security of supply, and consolidated cooperation.

Thailand: Imported volumes are expected to rise in the future because of increasing demand and decreasing

domestic gas production. The government is proceeding with liberalisation of the domestic gas market to establish an equitable and transparent energy market, with measures to grant third-party access to LNG facilities and enhance pipeline and LNG terminal infrastructure. The government also has helped establish the ASEAN LNG partnership, to strengthen cooperation in different areas from upstream, LNG transportation, trading and procurement.

Tokyo Gas: As one of the biggest beneficiaries of the successful half century of LNG, the company intends to contribute to the LNG industry in the next 50 years, taking advantage of expertise, knowledge and human resources it developed during the past five decades. Southeast Asia, which has supported development of the Japanese LNG market through stable LNG supply, now expects to increase its own LNG use significantly. The company aims to help market development in the region.

Total (France): Asia is increasingly more important in the LNG industry. In

order to develop new LNG markets, infrastructure development is the key. Technological development can reduce required time and costs to construct LNG receiving terminals and change assumptions of LNG transactions significantly. New importing countries, new consumers and new demand segments could bring rebalancing of the current oversupply in the market much earlier than previously expected.

Trafigura: Commodity traders have gained more roles in the LNG markets in recent years, mainly encouraged by the emergence of new LNG buyers with FSRUs and shorter-term contracts.

Woodside (Australia): The prolonged period of low oil prices is deteriorating upstream companies' balance sheets, making financing of new LNG projects more difficult. While it is important for the government to improve institutional frameworks such as regimes of third-party access to LNG related infrastructure facilities, the government should also consider improving taxation frameworks to attract investment money. ■

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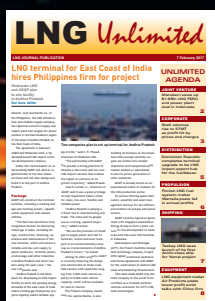
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World LNG Carrier Fleet

LNG carrier	Capacity m ³	Owned or Ordered by	Builder	Delivery Date	Flag	Power Plant	Cargo System	No. of tanks	Ship built for Export plant
Aamira	266,000	QGTC	Samsung	Dec-10	Liberia	DRL	TZ Mk. III	5	Qatargas IV
Abadi	135,000	Brunei Gas Carriers	Mitsubishi Nagasaki	Jun-02	Brunei	S	Moss	5	Brunei LNG
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 Khatiya	210,000	QGTC	DSME	Oct-09	Marshall Is.	DRL	GT No. 96	4	Qatargas IV
Al Khaznah	135,500	National Gas Shipping	Mitsui Chiba	Jun-94	Liberia	S	Moss	5	ADGAS
Al Khor	137,350	J4 Consortium	Mitsubishi Nagasaki	Dec-96	Japan	S	Moss	5	Qatargas
Al Khuwair	217,000	Teekay LNG	Samsung	Jul-08	Korea	DRL	TZ Mk. III	4	RasGas
Al Mafyar	266,000	OSG/Nakilat	Hyundai	Oct-07	Marshall Is.	DRL	TZ Mk. III	4	Qatargas II
Al Marrouna	151,700	Teekay	Daewoo	Nov-07	Bahamas	S	GT NO 96		Ras Gas I
Al Mayeda	266,000	QGTC	Samsung	Jan-09	Liberia	DRL	TZ Mk. III	5	Qatar-US/Var.
Al Nuaman	210,000	QGTC	DSME	Dec-09	Marshall Is.	DRL	GT No. 96	4	Qatargas IV
Al Oraiq	210,000	J5 Consortium	Daewoo	Apr-08	Marshall Is.	DRL	GT No. 96	4	Various
Al Rayyan	135,360	J4 Consortium	Kawasaki Sakaide	Mar-97	Japan	S	Moss	5	Qatargas
Al Rekayyat	216,200	QGTC	Hyundai	Jun-09	Bahamas	DRL	TZ Mk.III	4	Qatar-Atlantic
Al Ruwais	210,100	ProNav	Daewoo	Nov-07	Germany	DRL	GT NO 96	4	Qatargas II
Al Sadd	210,100	QGTC	Daewoo	Mar-09	Liberia	DRL	GT NO 96	4	Qatar-Atlantic Basin
Al Safliya	210,100	ProNav	Daewoo	Dec-07	Bahamas	DRL	GT NO 96	4	Qatargas II
Al Sahla	216,200	J5	Hyundai	Jun-08	Japan	DRL	TZ Mk. III	4	Ras Gas III
Al Samriya	261,700	QGTC	Daewoo	Sep-08	Marshall Is.	DRL	GT NO. 96	5	Qatargas II
Al Sheehaniya	210,100	QGTC	Daewoo	Feb-09	Liberia	DRL	GT NO 96	4	Qatar-Atlantic Basin
Al Shamal	217,000	Teekay LNG	Samsung	Jun-08	Qatar	DRL	TZ Mk. III	4	RasGas
Al Thakhira	145,000	Peninsular LNG	Samsung	Sep-05	Bahamas	S	TZ Mk. III	4	Qatargas
Al Thumama	216,000	J5 Consortium	Hyundai	Apr-08	Japan	DRL	TZ Mk. III	4	Rasgas
Al Utouriya	215,000	J5	Hyundai	Sep-08	Panama	DRL	TZ Mk. III	4	RasGas
Al Utourma	215,000	J5	Hyundai	Sep-08	Panama	DRL	TZ Mk. III	4	Ras Gas III
Al Wajbah	137,350	J4 Consortium	Mitsubishi Nagasaki	Jun-97	Japan	S	Moss	5	Qatargas
Al Wakrah	135,360	J4 Consortium	Kawasaki Sakaide	Dec-98	Japan	S	Moss	5	Qatargas
Al Zhubarah	137,570	J4 Consortium	Mitsui Chiba	Dec-96	Japan	S	Moss	5	Qatargas
Alto Acrux	147,000	LNG Marine Transport	Mitsubishi	Mar-08	Bahamas	S	Moss	4	Various
Amali	148,000	Brunei-Shell	DSME	Jul-11	Brunei	DFDE	GT No. 96	4	Brunei LNG
Amanl	154,800	Brunei-Shell	Hyundai	Nov-14	Brunei	DFDE	TZ Mk. III	4	Brunei LNG
Aman Bintulu	18,928	Perbadanan / NYK Line	NKK Tsu	Oct-93	Malaysia	S	TZ Mk. III	3	Petronas
Aman Hakata	18,800	Perbadanan / NYK Line	NKK Tsu	Nov-98	Malaysia	S	TZ Mk. III	3	Petronas
Aman Sendai	18,928	Perbadanan / NYK Line	NKK Tsu	May-97	Malaysia	S	TZ Mk. III	3	Petronas
Arctic Aurora	160,000	Dynagas	Hyundai	Jul-13	Marshall Is.	DFDE	TZ Mk. III	4	Various
Arctic Discoverer	140,000	K Line	Mitsui Chiba	Jan-06	Bahamas	S	Moss	4	Various
Arctic Lady	147,200	MOL/Hoegh LNG	Mitsubishi Nagasaki	Apr-86	Norway	S	Moss	4	Various
Arctic Princess	147,200	MOL/Hoegh LNG	Mitsubishi Nagasaki	Jan-06	Norway	S	Moss	4	Various
Arctic Sun	89,880	Arctic LNG Shipping	IHI Chita	Dec-93	Liberia	S	IHI SPB	4	ConocoPhillips/Marathon
Arctic Voyager	140,000	K Line	Kawasaki	Jul-06	Bahamas	S	Moss	4	Statoil
Arkat	148,000	Brunei-Shell	DSME	Feb-11	Brunei	DFDE	GT. No. 96	4	Brunei LNG
Arwa Spirit	165,000	Teekay LNG	Samsung	Sep-08	Marshall Is.	DFDE	TZ Mk. III	4	Various
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
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

CARRIER FLEET

Broog	135,466	J4 Consortium	Mitsui Chiba	May-98	Japan	S	Moss	5	Qatargas
Bu Samara	266,000	QGTC	Samsung	Dec-08	Qatar	DRL	TZ Mk. III	5	Qatargas
BW Suez Paris	162,400	BW Gas	Daewoo	May-09	N.I.S.	DFDE	GT NO 96	4	Yemen-Atlantic
BW Suez Brussels	162,400	BW Gas	Daewoo	May-09	N.I.S.	DFDE	GT NO 96	4	Yemen-Atlantic
Cadiz Knutsen	138,826	Knutsen / Marpetrol	IZAR Puerto Real	Jun-04	Spain	S	GT NO 96	4	Engas
Castillo de Santisteban	173,600	Elcano	STX	Aug-10	Malta	S	GT NO. 96		Various
Castillo de Villalba	138,000	Elcano	IZAR	Nov-03	Spain	S	GT NO 96	4	Sonatrach
Catalunya Spirit	138,000	Teekay LNG Partners	IZAR Sestao	Mar-03	Liberia	S	GT NO 96	4	Atlantic LNG
Celestine River	145,000	KLNG	Kawasaki	Dec-07	Bahamas	S	Moss		Various
CESI Gladstone	174,100	MOL-China LNG	Hudong	Oct-16	Hong Kong	S	GT No 96	4	Australia-China
CESI Qingdao	174,100	MOL-China LNG	Hudong	Nov-16	Hong Kong	S	GT No 96	4	Australia-China
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	Dynagas	Hyundai	Mar-07	Marshall Is.	S	TZ Mk. III	4	Various
Clean Force	150,000	Dynagas	Hyundai	Jan-08	Marshall Is.	S	TZ Mk. III	4	Various
Clean Ocean	155,900	Dynagas	Hyundai	Mar-14	Marshall Is.	DFDE	TZ Mk. III	4	Various
Clean Planet	155,900	Dynagas	Hyundai	Mar-14	Marshall Is.	DFDE	TZ Mk. III	4	Various
Clean Vision	160,000	Dynagas	Hyundai	Jun-15	Marshall Is.	DFDE	TZ Mk. III	4	Various
Cool Explorer	160,000	Thenamaris	Samsung	Oct-13	Bermuda	DFDE	TZ Mk. III	4	Various
Cool Runner	160,000	Thenamaris	Samsung	May-14	Bermuda	DFDE	TZ Mk. III	4	Various
Cool Voyager	160,000	Thenamaris	Samsung	Oct-13	Bermuda	DFDE	TZ Mk. III	4	Various
Corcovado LNG	160,106	TMSC Gas	Daewoo	Jun-14	Malta	TFDE	GT No 96	4	Various
Creole Spirit	174,000	Teekay	Daewoo	Jan-16	Bahamas	MEGI-DF	NO. 96 GW	4	Cheniere
Cubal	160,400	Mitsui/NYK/Teekay	Samsung	Jan-12	Bahamas	DFDE	TZ Mk. III	4	Various
Cygnus Passage	145,400	Cygnus LNG	Mitsubishi	Feb-09	Panama	S	Moss	4	Various
Dapeng Moon	147,000	China Ships	Hudong	Jul-09	China	S	GT NO 96	4	Various
Dapeng Star	147,000	China Ships	Hudong	Nov-09	China	S	GT NO 96	4	Various
Dapeng Sun	147,000	China Ships	Hudong	Jul-07	China	S	GT NO 96	4	Woodside Energy
Disha	136,000	Petronet LNG Ltd.	Daewoo	Jan-04	Malta	S	GT NO 96	4	Qatargas
Doha	137,350	J4 Consortium	Mitsubishi Nagasaki	Jun-99	Japan	S	Moss	5	Qatargas
Duhail	210,100	ProNav	Daewoo	Jan-08	Germany	DRL	GT NO 96	4	Various
Dukhan	135,000	J4 Consortium	Mitsui Chiba	Oct-04	Japan	S	Moss	4	Qatargas
Dwiputra	127,385	Humpuss Consortium	Mitsubishi Nagasaki	Mar-94	Bahamas	S	Moss	4	Pertamina
Ebisu	147,547	Golar LNG	Kawasaki	Sep-08	Bahamas	S	Moss	4	Various
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
Galicia Spirit	140,620	Teekay LNG Partners	Daewoo	Jul-04	Liberia	S	GT NO 96	4	Engas
Gaselys	153,500	GdF/NYK	Atlantique	Mar-07	France	DFDE	CS 1	4	Engas
Gallina	134,425	Shell Shipping	Mitsubishi Nagasaki	Oct-02	Singapore	S	Moss	5	Shell
GasLog Chelsea	153,000	GasLog	Hanjin Korea	Dec-09	Panama	TFDE	TZ Mk. III	4	Various
Gaslog Geneva	174,000	GasLog	Samsung	Sept-16	Bermuda	TFDE	TZ Mk. III	4	Shell charter
Gaslog Gibraltar	174,000	GasLog	Samsung	Oct-16	Bermuda	TFDE	TZ Mk. III	4	Shell charter
Gaslog Glasgow	174,000	GasLog	Samsung	Jun-16	Bermuda	TFDE	TZ Mk. III	4	Shell charter
Gaslog Greece	174,000	GasLog	Samsung	Mar-16	Bermuda	TFDE	TZ Mk. III	4	Shell charter
GasLog Salem	165,000	GasLog	Samsung	Apr-15	Liberia	TFDE	TZ Mk. III	4	various
GasLog Santiago	155,000	GasLog	Samsung	Mar-13	Liberia	TFDE	TZ Mk. III	4	Various
GasLog Saratoga	155,000	GasLog	Samsung	Dec-14	Bermuda	TFDE	TZ Mk. III	4	Various
Gaslog Savannah	155,000	GasLog	Samsung	May-10	Bermuda	DFDE	TZ Mk. III	4	Various
GasLog Seattle	155,000	GasLog	Samsung	Oct-13	Bermuda	TFDE	TZ Mk. III	4	Various
GasLog Shanghai	155,000	GasLog	Samsung	Jan-13	Liberia	TFDE	TZ Mk. III	4	Various
Gaslog Singapore	155,000	GasLog	Samsung	Jul-10	Bermuda	DFDE	TZ Mk. III	4	Various
Gaslog Skagen	155,000	GasLog	Samsung	Oct-13	Bermuda	DFDE	TZ Mk. III	4	Various
Gaslog Sydney	155,000	GasLog	Samsung	May-13	Bermuda	DFDE	TZ Mk. III	4	Various
GDF-Suez Global Energy	74,000	Gaz de France	Chantiers	Dec-06	France	DFDE	CS1	4	Sonatrach
GDF-Suez Cape Ann	145,000	Hoegh LNG/MOL	Samsung	May-10	Liberia	DFDE	TZ Mk. III	4	Various
GDF-Suez Neptune	145,000	Hoegh LNG/MOL	Samsung	Dec-09	Liberia	DFDE	TZ Mk. III	4	Various
GDF-Suez Point Fortin	154,200	LNG Japan	Imabari/Koyo	Feb-10	Panama	DFDE	TZ Mk. III	4	Various
Gemmata	138,100	Shell Shipping	Mitsubishi Nagasaki	Mar-04	Singapore	S	Moss	5	Shell
Ghasha	137,510	National Gas Shipping	Mitsui	Jun-95	Liberia	S	Moss	5	ADGAS
Gigira Laitebo	177,000	MOL-Itochu	Hyundai	Feb-09	Panama	DFDE	TZ Mk. III	4	Various
Golar Arctic	140,645	Golar LNG	Daewoo	Dec-03	Marshall Is.	S	GT NO 96	4	Shell Spot
Golar Bear	160,000	Golar	Samsung	Mar-14	Bermuda	DFDE	TZ Mk. III	4	Various
Golar Celsius	160,000	Golar LNG	Samsung	Sep-13	Bermuda	DFDE	TZ Mk. III	4	Various

Golar Crystal	160,000	Golar LNG	Samsung	Oct-13	Bermuda	DFDE	TZ Mk. III	4	Various
Golar Eskimo (FSRU)	160,000	Golar LNG	Samsung	Jan-15	Bermuda	DFDE	TZ Mk. III	4	Various
Golar Freeze	125,850	Golar LNG	HDW	Feb-77	UK	S	Moss	5	Various
Golar Glacier	162,000	Golar LNG	Hyundai	Sep-14	Marshall Is.	DFDE	TZ Mk. III	4	Various
Golar Grand	145,880	Golar LNG	Daewoo	2006	IoM		GT NO 96	4	Various
Golar Ice	160,000	Golar LNG	Samsung	Feb-15	Bermuda	DFDE	TZ Mk. III	4	Various
Golar Igloo (FSRU)	160,000	Golar LNG	Samsung	Oct-13	Bermuda	DFDE	TZ Mk. III	4	Various
Golar Kelvin	160,000	Golar LNG	Samsung	Jan-15	Bermuda	DFDE	TZ Mk. III	4	Various
Golar Maria	145,950	Golar LNG	Daewoo	2006	Marshall Is.		GT NO 96	4	Various
Golar Mazo	135,225	Golar LNG/CPP	Mitsubishi	Jan-00	Liberia	S	Moss	5	Pertamina
Golar Penguin	160,000	Golar LNG	Samsung	Mar-14	Marshall Is.	DFDE	TZ Mk. III	4	Various
Golar Seal	160,000	Golar LNG	Samsung	Aug-13	Bermuda	DFDE	TZ Mk. III	4	Various
Golar Singapore (FSRU)	160,000	Golar LNG	Samsung	June-15	Bermuda	DFDE	TZ Mk. III	4	Various
Golar Snow	160,000	Golar LNG	Samsung	Jan-15	Bermuda	DFDE	TZ Mk. III	4	various
Golar Tundra (FSRU)	160,000	Golar LNG	Samsung	Dec-15	Bermuda	DFDE	TZ Mk. III	4	Various
Golar Viking	140,000	Golar LNG	Hyundai	Jan-05	Marshall Is.	S	Moss	4	Various
Golar Winter	138,250	Golar LNG	Daewoo	Apr-04	Marshall Is.	S	GT NO 96	4	Petrobras
Grace Acacia	150,000	Algaet Shipping	Hyundai	Jan-07	Japan	S	TK MK III	4	Various
Grace Barleria	150,000	Swallowtail Ship	Hyundai	Oct-07	Japan	S	TZ Mk. III	4	Various
Grace Cosmos	150,000	AGH Shipping	Hyundai	Mar-08	Japan	S	TZ Mk. III	4	Various
Grace Dahlia	177,000	Tokyo Gas	Kawasaki	Oct-13	Japan	S	Moss	4	Various
Gracilis	138,830	Golar LNG	Hyundai	Jan-05	Marshall Is.	S	TZ Mk. III	4	Shell BG
Granatina	140,645	Shell Shipping	Daewoo	Dec-03	Singapore	S	GT NO 96	4	Shell
Grand Aniva	147,200	Sovcomflot/NYK	Mitsubishi	Jan-08	Japan	S	Moss	4	Various
Grand Elena	147,200	Sovcomflot/NYK	Mitsubishi	Oct-07	Japan	S	Moss	4	Various
Grand Mereya	147,200	Primorsk/MOL/K Line	Chiba	May-08	Japan	S	Moss	4	Sakhalin II
Hanjin Muscat	138,200	Hanjin Shipping	Hanjin	Jul-99	Panama	S	GT NO 96	4	Oman Gas
Hanjin Pyeong Taek	130,600	Hanjin Shipping	Hanjin	Sep-95	Panama	S	GT NO 96	4	Pertamina
Hanjin Ras Laffan	138,214	Hanjin Shipping	Hanjin	Jul-00	Panama	S	GT NO 96	4	QatarGas
Hanjin Sur	138,333	Hanjin Shipping	Hanjin	Jan-00	Panama	S	GT NO 96	4	Oman Gas
Hispania Spirit	140,500	Teekay LNG Partners	Daewoo	Sep-02	Spain	S	GT NO 96	4	Atlantic LNG
Hoegh Gallant FSRU	170,050	Hoegh LNG	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
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

CARRIER FLEET

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 Achilles	174,000	Maran	Hyundai Samho	Feb-16	Greece	DFDE	GT No 96	4	Various
Maran Gas Agamemnon	174,000	Maran	Hyundai Samho	May-16	Greece	DFDE	GT No 96	4	Various
Maran Gas Alexandria	161,870	Maran	Hyundai Samho	Sep-15	Greece	DFDE	TZ Mk. III	4	Various
Maran Gas Amphipolis	173,400	Maran	Daewoo	Aug-16	Greece	DFDE	GT No 96	4	Various
Maran Gas Apollonia	161,870	Maran	Daewoo	Jan-14	Greece	DFDE	GT No 96	4	Various
Maran Gas Asclepius	145,000	Kristen Navigation	Daewoo	Jul-05	Bermuda	S	GT No 96	4	Qatar
Maran Gas Coronis	145,700	Maran	Daewoo	Sep-07	Greece	S	GT No 96	4	Rasgas II
Maran Gas Delphi	159,800	Maran	Daewoo	Feb-14	Greece	DFDE	GT No 96	4	Various
Maran Gas Efessos	159,800	Maran	Daewoo	Jun-14	Greece	DFDE	GT No 96	4	Various
Maran Gas Hector	174,000	Maran	Hyundai Samho	Nov-16	Greece	DFDE	GT No 96	4	Various
Maran Gas Lindos	159,800	Maran	Daewoo	Jun-15	Greece	DFDE	GT No. 96	4	Various
Maran Gas Mystras	155,900	Maran Gas	Daewoo	May-15	Greece	DFDE	GT No 96	4	various
Maran Gas Pericles	174,000	Maran	Hyundai Samho	June-16	Greece	DFDE	GT No 96	4	Various
Maran Gas Posidonia	161,870	Maran	Daewoo	May-14	Greece	DFDE	GT No 96	4	Various
Maran Gas Roxana	173,400	Maran	Daewoo	Jan-17	Greece	DFDE	GT No 96	4	Various
Maran Gas Sparta	161,870	Maran	Hyundai Samho	April-15	Greece	DFDE	G TZ Mk. III	4	Various
Maran Gas Troy	155,900	Maran Gas	Daewoo	May-15	Greece	DFDE	GT No 96	4	various
Maran Gas Ulysses	174,000	Maran	Hyundai Samho	Jan-17	Greece	DFDE	GT No 96	4	Various
Maria Energy	174,000	Tsakos	Hyundai	Mar-15	Marshall Is.	TFDE	GTT Mk II	4	Various
Marib Spirit	165,000	Teekay LNG	Samsung	May-08	Marshall Is.	DFDE	TZ Mk. III	4	Various
Matthew	126,540	Suez LNG Shipping	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	QGTG	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
Oak Spirit	173,400	Teekay	Daewoo	Jan-16	Bahamas	MEGI-DF	NO. 96 GW	4	Cheniere
Ob River	150,000	Lance Shipping	Hyundai	Oct-07	Marshall Is.	S	TZ Mk. III	4	Various
Onaiza	210,100	Nakilat	Daewoo	Apr-09	Liberia	DRL	GT NO 96	4	Qatar-Atlantic Basin
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 Eurys	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
Seri Camellia	150,000	MISC	Hyundai	Nov-16	Malaysia	S	Moss	4	Petronas
Sestao Knutsen	138,000	Knutsen	IZAR Sestao	Jan-07	Spain	S	GT NO 96	4	Atlantic LNG
Sevilla Knutsen	173,400	Knutsen	Daewoo	Jun-10	N.I.S.	DFDE	GT NO 96	4	Various
Shahamah	135,500	National Gas Shipping	Kawasaki Sakaide	Oct-94	Liberia	S	Moss	5	ADGAS
Shangra	266,000	QGTC	Samsung	Nov-09	Liberia	DRL	TZ Mk. III	5	Qatargas IV
Shen Hai	147,100	China LNG	Hudong Zhonghua	Sep-12	China	AB/CC Steam	GT NO 96	4	Various
Simaisma	147,700	Maran Gas Maritime	Daewoo	Jul-06	Greece	S	GT No 96	4	Qatar
SK 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	Dunkergue	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 Cheney	174,000	Maran	Hyundai Samho	March-16	Greece	DFDE	GT No 96	4	Various
Woodside Donaldson	165,500	Teekay LNG	Samsung	Dec-09	Singapore	DFDE	TZ Mk. III	4	Various
Woodside Goode	159,800	Maran	Daewoo	Jul-14	Greece	DFDE	GT No. 96	4	Various
Woodside 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	Tanks	Storage Capacity
Belgium	Zeebrugge	Fluxys	1987	4	380,000
Canada	Canaport Saint John	Irving Oil, Repsol	2009	3	480,000
Chile	Quintero	ENAP, Metrogas, Enagas	2009	3	334,000
	Mejillones	Engie, Codelco	2010	1	175,000
China	Beihai LNG, Guangxi	Sinopec	2015	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	3	530,000
	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
Dominican Republic	Punta Caucedo	AES Andres	2003	1	160 000
	Pori	Gasum Skangas	2016	1	30,000
Finland	Fos Tonkin	Elengy	1972	3	150,000
	Montoir-de-Bretagne	Elengy	1980	3	360,000
	Fos Cavaou	Engie, Total	2010	3	330,000
	Dunkirk LNG	EDF, Fluxys, Total	2016	3	570,000
Greece	Revithoussa	DEPA	2000	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, Hokkaido Electric	2012	2	380,000
	Okinawa	Okinawa Electric Power	2012	2	280,000
	Naoetsu	Inpex	2013	2	360,000
	Joetsu	Chubu	2011	3	540,000
	Hachinohe LNG	Nippon Oil	2015	2	280,000
	Hitachi LNG	Tokyo Gas	2015	1	230,000
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
	Tong-Yeong	Kogas	2002	17	2,620,000
Mexico	Altamira	Vopak, Enagas	2006	2	300,000
	Energia Costa Azul	Sempra LNG	2008	2	320,000
	Manzanillo	Samsung, Kogas, Mitsui	2012	2	300,000
Netherlands	Gate LNG	Gasunie, Royal Vopak	2011	3	540,000
Poland	Swinoujscie	Baltic Gaz System	2015	2	320,000
Portugal	Sines	REN Atlantico	2004	3	390,000

LNG Import Terminals (continued)

Country	Location (Project)	Owners	Start up	Storage	
				Tanks	Capacity
Puerto Rico	Penuelas	EcoElectrica	2000	1	160,000
Singapore	Singapore	Singapore Energy Authority	2013	3	540,000
Spain	Barcelona	Enagas	1969	8	840,000
	Huelva	Enagas	1988	5	610,000
	Cartagena	Enagas	1989	5	587,000
	Bilbao	Enagas, EVE	2003	3	450,000
	Sagunto	GNF, Osaka Gas, Oman Oil	2006	4	600,000
	Reganosa, Ferrol	Galicia, Sonatrach, Tojeiro	2006	2	300,000
	El Musel, Gijón,	Enagas	2013	2	300,000
	Yung-An	CPC	1990	6	690,000
Taiwan	Tai-chung	CPC	2009	3	480,000
	Map Ta Phut	PTT LNG	2011	2	320,000
Thailand	Map Ta Phut	PTT LNG	2011	2	320,000
Turkey	Marmara Ereğlisi	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
	Isle of Grain	National Grid	2005	8	1,000,000
UK	South Hook	ExxonMobil, Qatar Petroleum, Total	2009	5	775,000
	Dragon LNG, Milford Haven	Shell, Petronas	2009	2	310,000

LNG Import Terminal Projects

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

LNG FSRU Import Facilities

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

LNG Export Projects

Country	Location/Project	Project Developers	Planned Start Up	Number of Trains	Capacity In MTPA
AUSTRALIA	Browse LNG	Woodside, BHP, BP Chevron, Shell, Mitsubishi, Mitsui	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.	2021	4	24.0
	Bear Head LNG, Nova Scotia	LNG Ltd.	2021	4	8.0
	Cedar 1, 2, 3, Kitimat area	LNG Export Ltd (Haisla)	2021	studies	
	GNL Quebec, Saquenay	Freestone Capital and Breyer Capital	2021	4	10.0
	Goldboro LNG, Nova Scotia	Pieridae Energy	2021	2	10.0
	Grassy Point LNG	Woodside Petroleum	2021	studies	
	Kitimat LNG, BC	Woodside, Chevron	2021	2	10.0
	LNG Canada, BC	Shell, Mitsubishi, Kogas, PetroChina	2021	2	12.0
	Melford LNG project, Nova Scotia	H-Energy Hiranandani Group	Studies		
	Pacific Northwest LNG, BC	Petronas, Japex, Sinopec, Indian Oil, Brunei Petroleum	2021	2	12.0
	Shell Prince Rupert LNG,BC	Shell	2021	3	21.0
	Steelhead LNG, Bamfield	Steelhead LNG Corp	2021	2	12.00
	Vancouver Tilbury	WesPac Midstream	2021	1	3.25
EQ.GUINEA	Equatorial Guinea Fortuna FLNG	Ophir and Golar LNG	2019	1	2.0
INDONESIA	Sengkang LNG	Energy World Corp.	2017	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	2021	2	10
	Area 4 Onshore	Eni and partners	2021	2	10
	Area 4 FLNG	Eni and partners	2019	1	2.5
NIGERIA	NLNG Train 7	NNPC, Shell, BP, Total	2020+	1	8.4
PAPUA NEW GUINEA	Elk-Antelope LNG	Total, InterOil, Oil Search, Petromin	Studies		
RUSSIA	Yamal LNG Siberia	Novatek, Gazprom, Total	2018	3	16.5
	Sakhalin II expansion	Gazprom, Shell, Mitsui, Mitsubishi	2021	studies	
	Vladisvostok LNG	Gazprom, Itochu, various	2021	2	10.0
USA	Alaska LNG Nikiski	ExxonMobil, BP, ConocoPhillips, Alaska State	2021	3	20.0
	Annova LNG, Brownsville	Exelon Corp.	2021	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	2021	3	9.0
	Driftwood LNG, Louisiana	Tellurian Investments	2022	6	26.0
	Freeport LNG, Texas	Freeport LNG	2018	4	20.4
	Golden Pass, Texas	Qatar Petroleum, ExxonMobil	2021	3	15.6
	Jordan Cove Energy	Veresen Inc.	2021	2	6.8
	Lake Charles, Louisiana	Shell, ETE	2021	3	15.0
	Magnolia LNG	Louisiana LNG Ltd.	2021	4	8.0
	Port Arthur LNG	Sempra	2021	2	10.0
	Rio Grande LNG	NextDecade	2021	6	27.0
	Sabine Pass LNG, Louisiana	Cheniere	2016-19	5	22.5
	Southern LNG	Kinder Morgan	2019	4	2.0
	Texas LNG Brownsville	Chandra, Meyer, Samsung, others	2021	2	4.0
	VG LNG (Cameron Parish)	Venture Global	2019	10	10.0
	VG LNG (Plaquemines)	Venture Global	2021	10	20.0

LNG Exporters

Country	Location/Project	Shareholders	Start up	Liquefaction		Storage	
				Trains	capacity (nominal) mtpa	No. of tanks	Total capacity m ³
ABU DHABI (UAE)	Das Island (Adgas)	ADNOC, Mitsui, BP, Total	1977 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
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		
	RasGas II- T4	QP, ExxonMobil	2005	1	4.7	6	840,000
	RasGas II- T5	QP, ExxonMobil	2007	1	4.7		
	Rasgas III – T6	QP, ExxonMobil	2009	1	7.8		
	Rasgas III – T7	QP, ExxonMobil	2010	1	7.8		
RUSSIA	Sakhalin Island	(Sakhalin Energy) Gazprom, Shell, Mitsui, Mitsubishi	2009	2	9.6	2	200,000
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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