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US as LNG exporter gives forecasts for worldwide energy through 2040

First Gulf Coast export plant is just the start of North American era as global supplier

A United States energy market forecast through to 2040 suggests natural gas consumption will grow by 1.9 percent per annum, backed by abundant shale-gas resources and robust production as regional pricing begins to develop in Asian markets along the lines of the Henry Hub benchmark.

Overall energy consumption worldwide is projected to increase by 48 percent over the next three decades, led by the Asia-Pacific region and by developing countries, according to the International Energy Outlook 2016 published by the US Energy Information Administration.

Trade growth

Liquefied natural gas accounts for a growing share of the world's natural gas trade as it more than doubles from 12 trillion cubic feet (Tcf) to 29 Tcf in 2040.

This includes new LNG export plants being constructed on the Gulf Coast and on the East Coast of the US.

Currently only one US LNG export plant is operational at Sabine Pass in Louisiana and owned by Houston-based Cheniere Energy.

"Natural gas will be a leader in providing energy from increasing supplies of shale gas, coal-seam gas and tight gas," the government agency stated.

These sources "will contribute to the strong competitive position of natural gas" in the future, the EIA said.

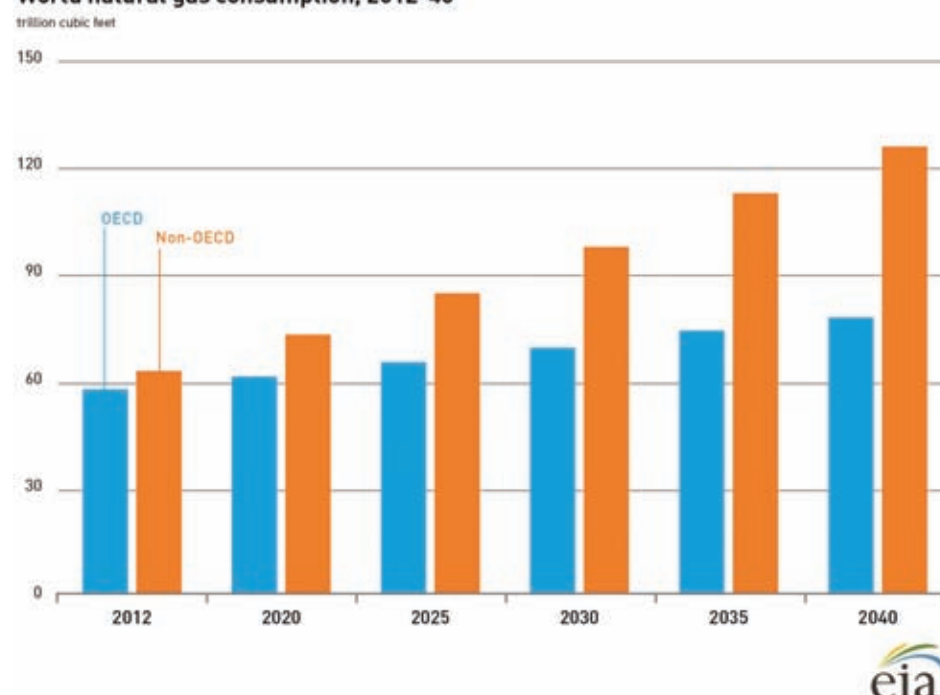
Consumption of natural gas worldwide is projected to increase from 120 Tcf to 203 Tcf in 2040.

Japanese demand

Two of the world's largest LNG importers, Japan and South Korea, will continue to increase their consumption through 2040, according to the report.

Japan's natural gas consumption does not slow between 2020 and 2040, though

World natural gas consumption, 2012-40



World energy demand continues to increase - led by natural gas

its use of coal for power generation does decline.

As a result, the natural gas share of Japan's total energy consumption rises from 25 percent in 2020 to almost 30 percent in 2040.

South Korea's natural gas consumption, most of it from regasified LNG, grows at average rates of 2.3 percent per annum from 2012 to 2020 and 1.7 percent a year from 2020 to 2040, according to the US projection.

"Most of the increase in liquefaction capacity occurs in Australia and North America, where a multitude of new projects are planned or under construction, many of which will become operational within the next decade," the report explained.

"At the same time, existing facilities in North Africa and Southeast Asia have been under-utilized or are shutting down because of production declines at many of the older gas fields associated with the liquefaction facilities, and because domestic natural gas consumption is

more highly valued than exports," it added.

The report said there was more to learn about the extent of the world's tight-gas, shale-gas and coal-seam-gas resource base, though it forecast "a substantial increase in those supplies", especially in China, the US and Canada.

Fracking

"The application of horizontal drilling and hydraulic fracturing technologies has made it possible to develop the US shale-gas resource, contributing to a near doubling of estimates for total US technically recoverable natural gas over the past decade.

"Shale gas accounts for more than half of US natural gas production and tight-gas, shale-gas, and CSG resources in Canada and China will account for about 80 percent of total production in 2040 in those countries," the EIA said.

Total natural gas production in the US, China and Russia, including shale gas, accounts for nearly 44 percent of the



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overall increase in world natural gas production.

The report also touched on the future pricing of LNG and natural gas in the Asia-Pacific region.

“In Asian markets, unlike those in the US, natural gas prices typically reflect contracts that are indexed to prices for crude oil or petroleum products.

“The declines in crude oil prices between August 2014 and January 2015 and low oil prices since then had a significant effect on Asian natural gas prices and markets.

Hub prices

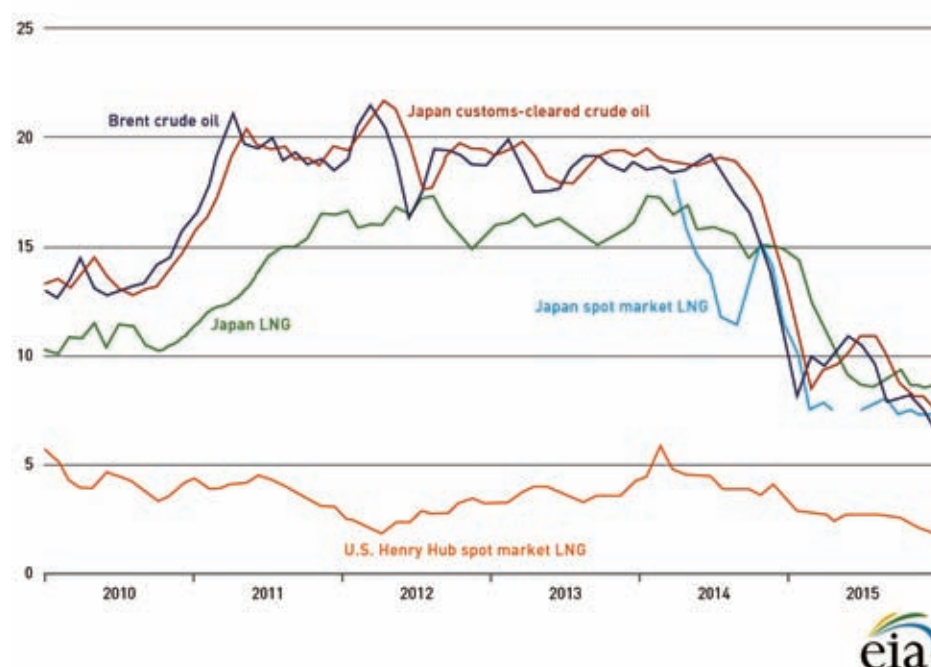
“However, Asian countries are developing regional trading hubs to set natural gas prices that better reflect market dynamics.

“In 2014, almost 30 percent of global trade in LNG occurred on a short-term or spot basis. Asian countries accounted for three-quarters of that total and one-third of the global natural gas trade.

“From 2011 to 2014, high crude oil prices resulted in higher prices for LNG imports. In Asia, most natural gas is imported as LNG, with LNG prices traditionally indexed to crude oil on a long-term, contractual basis,” the report noted.

“Currently there is no globally integrated market for natural gas, and pricing mechanisms vary by

World crude oil, natural gas, and liquefied natural gas prices, 2010-15
nominal dollars per million Btu

**LNG prices have plunged along with global energy markets**

prices and the substitutability of natural gas and petroleum products in some markets.

Optionality

“For example, some Asian countries have the option to burn either natural gas or petroleum for electricity generation.

“Although long-term contracts indexed to crude oil prices remain Asia’s predominant pricing mechanism, natural gas is beginning to be traded in one-time transactions on the spot market, or under short-term contracts that more

trade,” it explained. Several Asian countries - including Japan, China, and Singapore - are developing regional trading hubs with the goal of increasing price formation transparency.

- Japan launched an LNG futures contract on the Japan over-the-counter exchange in September 2014, settled against the Rim Intelligence Co. Daily Pricing Index. However, only one trade has been made since its inception. The country’s lack of pipeline connectivity with other markets, low volumes of flexible LNG and a lack of LNG price transparency and liquidity have limited spot LNG trading activity on the exchange.
- Singapore’s Stock Exchange launched the Singapore SGX LNG Index Group (SLInG) in June 2015. The index provides free-on-board prices (excluding shipping costs) for LNG cargos from Singapore to different destinations, reflecting regional spot prices. Around 13 market players initially signed up to participate in the index, and 10 more were expected to join. However, trading volumes to date have been moderate.
- China launched the Shanghai Oil and Gas Exchange, which will trade both pipeline gas and LNG, on July 1, 2015. China’s diversified natural gas market, with expanding pipeline infrastructure and gas-on-gas competition, may offer a more liquid Asian natural gas price index, but high levels of government regulation make it less attractive as a regional benchmark.

Asian countries are developing regional trading hubs to set natural gas prices that better reflect market dynamics.

regional market.

“In most cases, internationally traded natural gas is indexed to crude oil prices, such as North Sea Brent or Japan customs-cleared crude (JCC), because of the liquidity and transparency of crude oil

closely reflect international

natural gas supply and demand balances,” the report added.

“Short-term and spot LNG trade in the Asia-Pacific market almost tripled from 2010 to 2014, when it represented 21 percent of global LNG trade and 7 percent of natural gas



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In Europe, where natural gas is imported both by pipeline and as LNG, prices are either indexed to crude oil prices or based on the spot market.

Europeans

Although most of the trade in Europe is based on long-term contracts, hub-based spot trading has increased significantly over the past decade. The primary benchmark prices for spot trading are the National Balancing Point (NBP) in the UK and the Title Transfer Facility (TTF) in the Netherlands.

The NBP and TTF prices have a strong influence on hub prices in other European markets because of their liquidity and interconnectivity with continental Europe.

Other trading hubs in continental Europe are growing in terms of traded volumes and the numbers of hubs and participants.

With the increasing volumes and liquidity in the European hubs, hub pricing is beginning to play a larger role. Some recent pipeline contracts in

continental Europe now include a hub-based price, rather than a traditional linkage to a basket of crude oil products.

Prices at Henry Hub, the US natural gas benchmark, can also affect global pricing through LNG trade.

US LNG

“By 2020, when all current US liquefaction projects are expected to be completed, the US will account for almost one-fifth of global liquefaction capacity and will have the third-largest LNG exports in the world (after Qatar and Australia),” the report said.

Almost 80 percent of US LNG export volumes for projects currently under construction have been contracted on pricing terms directly linked to the Henry Hub price, or under a hybrid pricing mechanism with some kind of link to Henry Hub.

The flexibility of destination clauses in US LNG export contracts and the introduction of hub indexes are expected to promote greater liquidity in global LNG trading, shift pricing away from oil-

based indexes, and contribute to the development of Asian regional trading hubs and pricing indexes.

“Natural gas remains a key fuel in the electric power sector and in the industrial sector. In the power sector, natural gas is an attractive choice for new generating plants because of its fuel efficiency,” the EIA said.

“Natural gas also burns cleaner than coal or petroleum products, and as more governments begin implementing national or regional plans to reduce carbon dioxide (CO₂) emissions, they may encourage the use of natural gas to displace more carbon-intensive coal and liquid fuels,” it added.

Users

World consumption of natural gas for industrial uses increases by an average of 1.7 percent a year and in the electric power sector by 2.2 percent a year through to 2040.

“The industrial and electric power sectors together account for 73 percent of the total increase in world natural gas consumption through 2040,” the

report said. The growing economies of China, India, and other emerging Asian markets are a key driver of the global energy outlook.

China accounts for almost two-thirds (63 percent) of the growth in non-OECD Asia's natural gas consumption to 2040.

Total consumption of natural gas in China increases by an average of 6.2 percent a year from 5.1 Tcf in 2012 to 27.5 Tcf in 2040.

“China's central government is promoting natural gas as a preferred energy source and has set an ambitious target of increasing the share of natural gas in its overall energy mix to 10 percent (or around 8.8 Tcf) by 2020 to alleviate pollution from its heavy coal use,” the EIA said.

“Natural gas consumption in China totals 9.1 Tcf in 2020, or about 6 percent of the country's total energy consumption.

“In 2040, the natural gas share of China's energy consumption is 15 percent - still less than coal's 44 percent share,” the report stated. ■



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Potential for LNG shipments and growing pipeline exports from Iran after sanctions

Even Iranians say they will need \$100Bln of investment to rebuild natural gas industry

The US Government says Iran has the second-largest proved reserves of natural gas in the world after Russia and it has a strong potential to develop those resources at a faster pace after the recent lifting of nuclear-related sanctions.

Iran is targeting a substantial increase in natural gas production in the coming years, not only to meet rapidly growing domestic demand, but also to boost its export capacity, primarily by pipeline.

LNG vision

In the longer term, Iran plans to build LNG export facilities for global shipments of cargoes, according to the the International Energy Outlook just published by the US Energy Information Administration.

Additional production of natural gas for export markets will compete with Iran's domestic demand for natural gas, which is used both for reinjection in the production of oil and as a feedstock in the country's rapidly growing domestic petrochemical industry.

According to estimates by the National Iranian Gas Company (NIGC), more than \$100 billion in investment capital will be needed to rebuild Iran's natural gas industry.

However, it should not be forgotten that even before United Nations sanctions were imposed and nuclear concerns had emerged, the attitude of Iran's Revolutionary Guard in insisting on overseeing and having a stake in every project was part of doing business in Iran for many years.

Many western energy companies withdraw from the country on this very issue. Where are these people now? Are they still around and in positions of power? Investors need to pose these questions.

Complexities

The US report touches on these political issues while giving enlightening detail on the bare energy supply and demand aspects of Iran's recent emergence into the global market.

As well as being a producer, Iran is currently the fourth-largest natural gas consumer in the world after the US, Russia, and China, with total consumption of 15.4 billion cubic feet per day.

From 2005 to 2014, Iran's domestic consumption of natural gas grew by 66 percent, second only to the rate of increase in China.

"The residential, commercial, and public sectors and small industries accounted for 55 percent (8.4 Bcf/d) of Iran's total natural gas consumption," the US report said.

"Power plants and large industries accounted for 45 percent (7.0 Bcf/d) of Iran's total natural gas consumption in 2014," the US said, citing an NIGC document on strategic objectives.

The report added that Iran planned to increase the natural gas share of its domestic energy mix and more than double its natural gas processing capacity, from approximately 20 Bcf/d in 2014 to 42 Bcf/d by 2025, while reducing its consumption of fuel oil in power generation and replacing its ageing oil-fired plants with new natural gas-fired plants.

Domestic needs

The NIGC estimates that to meet the rapidly growing domestic demand for natural gas, Iran will need more than \$20Bln in investment to upgrade and expand its domestic pipeline infrastructure.

Iran plans to expand the domestic pipeline network to more than 35 Bcf/d by 2017, adding 1,709 miles (2,750km) of new pipelines at a cost of \$6.3Bln and investing more than \$15Bln in expansion and upgrades of the existing domestic pipeline network.

"Those expansions are likely to require foreign capital, and to attract foreign investors Iran has proposed various investment schemes, including build-operate-own-transfer," the US report said.

"Some foreign investors may be reluctant to proceed at this point because of concerns about corruption, red tape, and state influence over the economy. Consequently, it may take some time for the expansion plans to materialize," the US stated.

Demand surge

Iran has increased its domestic natural gas production five-fold over the past 20 years. Most of its natural gas production



Iran will have to rebuild ramshackle industry with huge investments

comes from the South Pars field, the largest natural gas field in the world, which Iran shares with Qatar in the Gulf.

On Qatar's side, the field is called the North Field. Iran is developing 28 phases in South Pars, 10 of which are operational.

Phase 12 began production in early 2015, producing 3 Bcf/d of natural gas and 120,000 b/d of condensate. Production from phases 15 and 16 began at the end of 2015.

Between 2015 and 2020, Iran has the potential to add between 8 Bcf/d and 9 Bcf/d of new natural gas production, primarily from South Pars.

The Kish field, the largest non-shared natural gas field in the country, is also being developed. Kish has a production target of 0.9 Bcf/d of natural gas and 4 million barrels of gas condensate per year, and \$1.4 billion has been allocated for its development.

After 2020, Iran has said it planned to develop its North Pars, Golshan and Ferdowsi natural gas fields.

Long term

"LNG exports from Iran may be a longer-term development. Iran will face strong competition, and its projects may not be economically viable in the current environment of low oil prices," the US report said.

"Among the projects that have been proposed, the Iran LNG project (capacity 1.4 Bcf/d) may be the most likely to materialize after 2020.

"Iran has already spent \$2.5 billion to

build LNG port facilities, tank storage and other infrastructure for the project and can now gain access to liquefaction technology not available when sanctions were in place," the US added.

Options

"NIGC's announced target of increasing its natural gas liquefaction capacity to 10 percent of the world total by 2025 is not likely to be met.

"However, some smaller projects - including delivering natural gas via pipeline to Oman to use spare capacity in the Qalhat LNG liquefaction project, and the use of Das Island liquefaction facility in Abu Dhabi - are more likely to be developed in the next few years," according to the US.

Elsewhere in the Middle East, Yemen, Oman, and Abu Dhabi of the United Arab Emirates also are current exporters of LNG.

However, the potential for growth in their exports in the Middle East appears to be limited by their need to meet increases in their own domestic demand.

Iran will raise most export revenue for now from pipeline exports.

About 93 percent of Iran's pipeline exports (0.9 Bcf/d) go to Turkey, and 0.03 Bcf/d most recently were exported to Armenia and Azerbaijan (net of imports from Azerbaijan).

Iran also imported 0.7 Bcf/d from Turkmenistan in 2014, or half of its contractual volumes, as Iran's growing production allowed it to become more

self-sufficient in delivering natural gas to its major consumption centres in the northern part of the country.

“The price of Iran’s natural gas exports to Turkey is one of the highest in the region, and it has been used as a benchmark for Iran’s other proposed pipeline export projects.

“However, the reluctance of Persian Gulf

sign contracts at those prices has been the main obstacle to Iran’s development of new pipeline export projects.

“Future contracts for exports to Gulf countries are likely to require some reduction in the prices of Iranian natural gas exports,” the EIA report said.

Development plan

Iran’s latest development plan, which outlines its economic goals for the next five years, sets a target to increase natural gas exports to more than 6 Bcf/d by March 2021.

“The target is based on expanding production primarily from the South Pars field, which can be exported by pipeline to Iran’s neighboring countries.

“In the plan, Iran has

prioritized pipeline exports over LNG exports, with a potential total of 3 Bcf/d to 4 Bcf/d in the next several years coming from projects that are close to completion.

“The focus of Iran’s export pipelines is on neighboring Persian Gulf countries, Pakistan, potentially India, and in the longer term, exports to European countries via Turkey,” the report added. Proposed projects to export natural gas by pipeline from Iran to countries outside the Persian Gulf involve considerable risk for a variety of reasons. The proposed projects include:

- Pakistan plans to link the Iranian pipeline with a proposed \$45Bln China-Pakistan Economic Corridor. Iran has built all but the final 155 miles on its side, and China is building a 435-mile stretch inside Pakistan that would move natural gas from Gwadar port in the West to Nawabshah in the South. The project requires building a short 50-mile leg to Gwadar from the border with Iran, which is likely to be financed by China. Risks include terrorist threats in Pakistan’s Baluchistan province, an

enclave of Pakistani insurgents, and contract pricing that has not been finalized.

- Iran is in discussions to revive the Iran-Pakistan-India Peace Pipeline project, which may be a longer-term development. India has proposed to develop Iran’s 12.8 Tcf Farzad-B natural gas field and is considering construction of subsea pipeline to link Iran directly with India. However, at an estimated cost of about \$5bln, the project is both expensive and technologically challenging.
- Iran also is considering exports to Europe via Turkey. An estimated \$5.1Bln investment would be required to expand a 1,120-mile, 56-inch-diameter pipeline that would connect Assaluyeh with Bazargan near the Turkish border.

Iran’s natural gas and LNG project agenda is currently full to over-flowing. Its potential ventures are many and varied.

They are also extremely challenging, even for a country without Iran’s complex and historically unstable profile.

The reluctance of Persian Gulf countries to sign contracts at those prices has been the main obstacle to Iran’s development of new pipeline export projects.

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For the Record

AIR PRODUCTS of the US, the leading maker of liquefied natural gas processing equipment, has sold its Performance Materials Division (PMD) to Germany's Evonik Industries AG, a specialty chemicals and materials company, for \$3.8 billion in cash. The Lehigh Valley, Pennsylvania-based company said the sale of PMD to the German firm was expected to be completed before the end of 2016 and was subject to regulatory approvals. "Under the terms of the agreement, operational facilities, supplier contracts, labs, contracts, customers, and employees and certain legal entities associated with PMD would transfer to Evonik," Air Products said. It was also stated that Evonik, whose headquarters are in Essen, Germany, intended to continue to run PMD from its current location in Allentown, Pennsylvania. Air Products additionally intends to spin-off its Electronic Materials Division (EMD) to shareholders as a separate public company, called Versum Materials, by the end of September 2016. Much of the worldwide supply of LNG is produced with technology supplied by Air Products. The company's portfolio of equipment is currently operating in over 100 LNG liquefaction Trains around the world. The sale of its unit to Evonik is part of its strategic five-point plan, which includes focusing on industrial gases and off-loading non-core businesses. "The sale of PMD is consistent with the long-term strategy for Air Products that we announced in September 2014," said Seifi Ghasemi, Chairman, President and Chief Executive of Air Products. "I am very pleased that PMD has a great future ahead of it as a core business of a company which is even larger than Air Products," Ghasemi stated. "As for the balance of our Materials Technologies segment, I am also very excited about the future of EMD, which we currently intend to spin-off as a new, world-class public company named Versum Materials. Guillermo Novo will be the CEO of the new company, and I will be non-executive chairman of Versum Materials while maintaining my current roles at Air Products," Ghasemi explained. "As a

result of these moves, Air Products will be in an even stronger position to take advantage of the exciting investment opportunities to grow our core Industrial Gases business," the CEO added. The PMD business sold to the German company generated more than \$1 billion in revenue over the past 12 months.

AWILCO LNG, the Norwegian shipping company said that an oversupply of shipping in the carrier market, limited growth in trade and a reduced ton-mile ratio have combined to keep the LNG spot market at "unsustainable levels" for more than one year, both in terms of low utilization and depressed freight rates. Awilco, with just two vessels currently operating in its fleet after two were laid up and another was sold, has found life particularly tough as it has struggled to make money from the shorter-term charter market. The company posted a first-quarter 2016 net loss of \$4.6 million compared with a loss of \$12.6M in the same quarter a year ago. Awilco, a subsidiary of the Awilhelmsen Group, is the smallest LNG carrier fleet operator and was set up and listed on the Oslo Stock Exchange in 2011 to play the short-term charter market. "The Far East gas price continued the declining trend during the quarter, starting at about \$6.9 per million British thermal units and ending at \$4.4 per MMBtu," Awilco said in explaining the market conditions. "The continuous falling Far East gas prices have further limited the arbitrage possibilities resulting in a persistent negative impact on ton-mile," the company added. Despite falling LNG prices, LNG imports to Japan and South Korea continued the weakening trend from 2015, and imports were down 6 percent and 5 percent respectively during the quarter. "On a positive note, LNG imports to China have finally started to improve after a disappointing 2015, increasing by 17 percent in the first quarter 2016," the Awilco report said. The company reported its own freight income for the first quarter at \$8.9M compared with \$9.6M in the fourth quarter of 2015. Vessel utilization was 78 percent compared with 81 percent in the previous quarter and operating expenses were \$2.4M compared with \$2.3M in the previous quarter. Administration expenses for the quarter were \$1M, up from \$800,000 in the previous three months. Depreciation for the quarter was recorded at \$3.6M. Interest expenses related to the two

ships "WilForce" and "WilPride" and their financial leases amounted to \$5.9M, Awilco said.

BMT GROUP Ltd, the London-based engineering consultant, was awarded the owner's engineer and lead design consultancy contract for the development of a liquefied natural gas storage and regasification facility in the Ivory Coast in West Africa. The contract was awarded by Endeavor Energy, an independent power development and generation company focused on Africa, to BMT's Asia-Pacific unit for work on the LNG facility that is part of the African nation's Songon gas-to-power project. The Songon venture is a greenfield development consisting of combined-cycle gas-fired power generation, featuring purpose-built LNG infrastructure and a floating storage and regasification unit (FSRU) to import cargoes. Endeavor and its partners have already significantly advanced the project in terms of obtaining the coastal site and starting the environmental approvals process with the Ivory Coast government. "At Songon, BMT will be conducting front-end-engineering level studies, including operability assessments, infrastructure design and optimization studies for the supply of gas from the LNG FSRU via subsea infrastructure to the onshore gas turbines outside the capital of Abidjan," BMT explained. Endeavor said previously it had initiated the environmental assessment for the transmission line and LNG infrastructure which will be completed in 2016. The company focuses on African power projects by providing and organizing development plans, financing and engineering and construction. Its headquarters are in Houston, Texas, with other offices in Abidjan in the Ivory Coast and Accra in Ghana, as well as Dubai in the United Arab Emirates. BMT said its appointment for the Ivory Coast work builds on the successful relationship established with Endeavor in 2015 in developing a similar LNG-led project for the neighbouring African state of Ghana. "The Songon Power Project, jointly led by Endeavor and Starenergie, is expected to add around 375 megawatts to the Ivory Coast national grid, a boost in generation capacity that will sustain and propel the country's rapidly expanding economy," said Andrew Bridson, Business Development Manager at BMT.

BUREAU VERITAS, the French classification society, said it reinforced its position in marine services where recent work included liquefied natural gas bunkering ship design, with the acquisition of a leading UK-based consultancy, TMC Marine Ltd. The UK firm, whose headquarters are in London and with a network of offices in the US and the Far East, focuses on marine claims and accident investigations, salvage and other services and whose client base includes insurers, law firms and ship owners. Headquartered in London, TMC has a network of offices in the US, China, Singapore and Australia. It employs over 50 people and generated revenues of 8.5 million euros (\$9.7M) in 2015. The value of the transaction was not disclosed. BV, whose base is in Neuilly-sur-Seine, near Paris, has recently been active in issuing requirements for liquefied natural gas bunkering tankers and their arrangements for transferring LNG to ships using the fuel. The French class society believes that securing safe LNG bunkering methods is the key to a swift uptake of the fuel by the shipping industry. BV has additionally granted an approval in principle to French LNG containment manufacturer Gaztransport and Technigaz (GTT) for an LNG bunker tanker design. The approval covers GTT's latest 4,000 cubic metres cargo capacity bunkering ship concept. "TMC is a recognized brand that enables the group to enhance its offering to the marine insurance consultancy market, thereby expanding the services that we already provide in offshore to the maritime market," said Didier Michaud-Daniel, Chief Executive of BV. "Our Marine and Offshore business, the historical activity of Bureau Veritas, is one of our eight key growth initiatives to 2020. As such, it is evolving rapidly. We are diversifying our service portfolio and developing our technological leadership in order to meet all our clients' expectations in risk management," Michaud-Daniel stated. Tony Bowman, Chairman of TMC, said of the takeover: "We are very happy to be joining the expanding Marine and Offshore division of Bureau Veritas, a leading service provider to the international marine industry. This is a strategic alliance that will provide TMC with technical synergies and greatly enhance the services we can offer to new and existing clients while at the same time continuing our plan of further geographic expansion."

CAMERON LNG, being developed by California-based Sempra Energy and Japanese and French investors, has received authorization from the US Federal Energy Regulatory Commission to build two additional liquefaction Trains and five in total for almost 25 million tonnes per annum in production. Sempra's existing LNG import terminal is being transformed into a liquefaction plant on the shore of the Calcasieu Ship Channel at Hackberry in Cameron Parish, Louisiana. Sempra is developing the Cameron plant with Japanese partners Mitsui & Co. and Mitsubishi Corp. and French utility and LNG player Engie, the former GDF-Suez. The Hackberry liquefaction plant is being built by LNG engineering companies CB&I of the US and Japan's Chiyoda Corp. The new FERC order will allow Sempra to build what it will call Train 4 and Train 5 as well as a fifth LNG tank with 160,000 cubic metres of storage. "The design of these Trains is identical to the design of the three other trains currently being constructed at the LNG terminal. Cameron also proposes to construct and operate a condensate product storage tank and associated utilities and infrastructure consisting of two new boil-off gas compressors to be used during the liquefaction process, three 2.5-megawatt diesel engine backup generators, a diesel storage tank and a new demineralized water system," the FERC authorization noted. The proposed expansion would allow Cameron to export an additional 515 billion cubic feet per annum of domestically-produced natural gas or the exact equivalent of 9.97 MTPA. "The proposals would increase the LNG terminal's export capability to approximately 1.29 trillion cubic feet per year of domestically-produced natural gas or 24.92 MTPA of LNG," it said. "The Sempra project states that the liquefaction facility would receive feed-gas for the expansion via an existing interconnection with Cameron Interstate Pipeline and a recently certificated interconnection with Columbia Gulf Transmission, LLC," the FERC report said. The whole Cameron project already has environmental approval. "We conclude that if constructed and operated in accordance with Cameron's application and supplements, and in compliance with the environmental conditions, our approval of this proposal would not constitute a major federal action significantly affecting the quality of the human environment," the notice said.

CANADA's province British Columbia has mounted its latest trade mission to Asia to try and get liquefied natural gas development plans back on track after project postponements and threats by the federal government in Ottawa to block ventures. Premier Christy Clark is visiting the world's two largest LNG importers, South Korea and Japan, as well as future importer, the Philippines, from May 24-31. "The mission is focused on opening new doors in the Philippines and developing new export markets in technology and liquefied natural gas with established trade partners in Japan and South Korea," said a statement. Clark is leading a delegation of representatives from almost 80 businesses and organizations on her seventh trade mission to Asia, travelling to South Korea from May 24-25, the Philippines from May 26-27 and Japan from May 28-31. "This trade mission is about developing new trade and investment opportunities with Japan and Korea, while looking at what the future holds in Southeast Asia as we develop a stronger trade presence in the Philippines," said Clark. Japanese and South Korean companies such as Mitsubishi Corp. and Korea Gas Corp. are potential investors in the LNG export project led by Royal Dutch Shell and whose final investment decision has been postponed until the end of 2016. Previously around 20 LNG export and production ventures were planned for the province, though only two are now moving forward. These are the Asian-led Woodfibre LNG project at the town of Squamish in BC that would send shipments to China, and the expansion of a small-scale production plant at Tilbury, north of Vancouver, to export containers to Hawaii. "Businesses and organizations representing a wide variety of sectors, from international education and digital media, to LNG, clean technology and professional services, will be travelling on this mission to form partnerships and attract new trade and investment dollars," she added. "BC is leading Canada right now because we have both a diverse economy and diverse export markets. This mission is an opportunity to build on that success," she added. Premier Clark will also promote the free trade opportunities that are being created under the Canada-Korea Free Trade Agreement, which came into effect January 1, 2015, and the Trans-Pacific Partnership, which currently is in the ratification process. Japan and South Korea are BC's third-largest and fourth-largest trade partners respectively.

CANADA's native North American tribe, the Haisla First Nation, said the best prospects for a liquefied natural gas export project going ahead soon in its traditional area rested with the LNG Canada venture of Royal Dutch Shell. The Haisla chief councillor, Ellis Ross, expressed optimism about the Shell project in an interview published on his tribe's web site. Ross, who has been chief since 2011 and chairman of the Aboriginal Business and Investment Council in the province of British Columbia, said the Haisla had supported several projects over the years. The Haisla tribe is based around Kitimat, a coastal community in BC with just over 9,000 residents and located about 650 kilometres north of Vancouver. The projects proposed in the area include the Kitimat LNG project of Chevron Corp., as well as the Douglas Channel LNG venture of Canada's AltaGas and Shell's LNG Canada plant. The oil price slump since 2014 has altered the economics of the industry worldwide and has led to the cancelation or postponed of many projects. In the case of Kitimat, the development of Chevron's Kitimat LNG venture has been slowed, the investment decision postponed by Shell and its partners on LNG Canada, while the AltaGas Douglas Cove project has been cancelled outright. "I believe the best hope for the Haisla to prosper economically now rests with the plans of LNG Canada to a build a facility on the site of the former methanol plant in Kitimat," he said. "If I had it my way, I would like to be in a position where I could help aboriginals, not just the Haisla, bring up their standard of living," Ross said. The Haisla pointed out that site preparation work was continuing at the LNG Canada site and the company said it was currently awaiting a final investment decision expected later in 2016. Shell's partners in the LNG Canada venture are three of the largest Asian companies involved in LNG, Korea Gas Corp., PetroChina and Japan's Mitsubishi Corp. Canada's National Energy Board as recently as January 2016 awarded its first 40-year LNG export licence to the Shell-led venture. The building of the liquefaction plant was to have started soon at the industrial site acquired by Shell near Kitimat. The first phase plan was for two LNG processing Trains, each with the capacity to produce 6.5 million tonnes per annum, with an option to add two more Trains. "While there are critics of LNG in Kitimat, there is community

support for the industry," he said. Ross added that there were benefits for the environment from LNG. "This is the kind of product that we need, to get Asia off dirty fuel," Ross said. The Haisla cited statements during May from Shell on the activities linked to the LNG Canada venture, The LNG Canada project is one of an original 20 proposed for BC and has already secured key licences, including a permit to build the liquefaction facility on industrial land from the province's Oil and Gas Commission. However, the venture still needs to secure final federal authorization. LNG Canada said it was continuing with field trials at the project site and on May 5 issued a statement saying it was beginning engineering and planning work for a workforce accommodation centre to house 4,500 persons required during construction of its proposed liquefaction and export facility in Kitimat. The Shell-led venture noted, however, that Construction would "not commence unless LNG Canada's joint venture participants have made a positive investment decision."

CHENIERE ENERGY, the first liquefied natural gas exporter from the US Gulf Coast after its Sabine Pass liquefaction plant in Louisiana began operations in February, saw its shares surge more than 6 percent in one day after it named a new Chief Executive to help make Cheniere "one of the top global LNG companies" and ending months of uncertainty. Cheniere named former Calpine Corp. CEO Jack Fusco to lead the company with immediate effect to replace interim CEO Neal Shear. Fusco was a Vice President at one time for US investment bank Goldman Sachs, Shear himself had agreed to temporarily replace the company's founder Charif Souki in December 2015 after Souki was fired following disagreements with the active billionaire US investor Carl Icahn, who had become Cheniere's biggest shareholder and questioned the CEO's large salary package. New CEO Fusco was head of Houston-based power company Calpine from August 2008 to May 2014 and served as executive chairman of its board. Fusco joined Calpine just as that company was emerging from bankruptcy. Calpine is now America's largest generator of natural gas fired electricity. Cheniere's share on the New York Stock Exchange surged 6.2 percent after the CEO announcement to close at \$34.75. The company said it was pleased to hire Fusco

who has spent more than 30 years in the energy industry and “has significant experience leading companies with large-scale, asset-intensive portfolios and implementing corporate strategies” focused on investment. “This experience will translate well as we make our transition into one of the top global LNG companies with a platform substantially underpinned with long-term sale and purchase agreements,” said G. Andrea Botta, Chairman of the Cheniere board. “The Board would like to thank Neal for his leadership during his term as interim President and CEO,” Botta added. “During this period, Cheniere began exporting LNG from the first train completed at Sabine Pass; construction of the additional trains continues on time and on budget. Neal will continue to serve on the Board and will be a special advisor to the CEO, ensuring an orderly transition,” Botta said. Fusco said Cheniere was well-positioned for success as a global LNG market leader. “Our priorities will be focused on continued execution and completion of the LNG trains, both under construction and under development, and further commercialization of our LNG portfolio”, said Fusco. “Finally, I look forward to working with the Cheniere team as we seek to create long-term value for our shareholders,” he added. Fusco began with his employment at Pacific Gas & Electric Co. on graduation from California State University, Sacramento with a Bachelor of Science in Mechanical Engineering in 1984. He joined Goldman Sachs 13 years later as a Vice President with responsibility for commodity trading and marketing of wholesale electricity.

CHENIERE saw its losses widen in the first quarter to \$320.8 million as it entered the transition phase from a development to an operating company. So

far only one liquefaction Train is on stream to produce 4.5 million tonnes per annum, though final capacity will be 27 MTPA when the other five processing

Trains are completed in the next couple of years. Cheniere said its first-quarter losses were due to interest rate derivatives costs and one-time items. Its

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losses in the same three months of last year amounted to \$267.7M. The Houston-based company noted in its earnings highlights the February 2016 shipment of the first LNG commissioning cargo from Sabine Pass. The company said a total of four commissioning cargoes were loaded and exported during the first quarter and a total of seven commissioning cargoes have been loaded and exported to date. Cheniere was also continuing to finance its construction and operations and in February closed new \$2.8-billion credit facilities over four years. “The first quarter of 2016 was a very significant period for Cheniere, marking our transition from a development company into an operating one,” said Neal Shear, Cheniere’s interim President and Chief Executive. “We commenced LNG production and exports from Train 1 at Sabine Pass as part of commissioning activities. Commissioning activities at Train 2 are underway and our remaining Trains under construction continue ahead of their respective contractual schedules and on budget,” said Shear. “On the financial front, we took a significant step in improving our consolidated debt maturity profile, as the (new) credit facilities ensure there will be no debt maturities at Cheniere until 2020,” the acting CEO said. Shear was named as acting CEO after the removal of Charif Souki at the end of the fourth quarter of 2015. Souki was replaced on December 13 after 19 years at the helm of Cheniere because of policy differences with a new shareholder, namely US billionaire investor Carl Icahn, who apparently took exception to his large pay and options package. Cheniere gave an update in the earnings statement of the current status of its other LNG Trains being constructed by Bechtel, the lead engineering and construction company on the Sabine Pass project. “Train 1 is expected to reach substantial completion imminently, after which Cheniere Partners expect to take over care, custody and control. Train 2 is undergoing the commissioning process. A Train is expected to achieve substantial completion upon the completion of construction, commissioning and successfully satisfying certain tests. Cheniere expects substantial completion of Train 2 to be achieved in September 2016,” it said. “Construction of Trains 3 and 4 began in May 2013, and as of March 31, 2016, the overall project completion percentage for Trains 3 and 4 was approximately 83.8 percent, which is ahead of the contractual schedule,” the

company added. Cheniere expect Trains 3 and 4 to reach substantial completion in 2017. Construction on Train 5 began in June 2015, and as of the end of March the overall project completion percentage for Train 5 was 28.8 percent, which Cheniere said was ahead of schedule. The company expects Train 5 to reach substantial completion in 2019. Train 6 is currently under development, with all necessary regulatory approvals in place. “Cheniere expects to make a final investment decision and commence construction on Train 6 upon, among other things, entering into an engineering, procurement and construction contract,” it said. As regards the second plant it is developing at Corpus Christi in Texas, Cheniere said the three Trains are in various stages of construction and development to produce a total of 13.5 MTPA. “Construction of Trains 1 and 2 began in May 2015, and as of March 31, the overall project completion percentage for Trains 1 and 2 was 32.5 percent, which is ahead of schedule,” Cheniere said. “Train 3 is under development, with all necessary regulatory approvals in place. We have entered into an LNG Sale and Purchase Agreement for approximately 0.8 MTPA of LNG volumes that commence with Train 3 and expect to commence construction upon entering into additional SPAs and obtaining adequate financing,” the company explained.

CHIYODA CORP, the Japanese LNG and energy project engineer, working on projects in Australia, Mozambique, Russia and the US, said full-year fiscal 2016 sales rose 27 percent to 611.54 billion yen (\$5.63Bln) compared with 480.97Bln yen in the 2015 fiscal year, though net operating income and profitability crashed. Chiyoda said net operating income dropped more than 25 percent to be just 16.01 billion yen (\$147M) on March 31, 2016. “The operating income was lower than the forecast due to the increase in construction costs to meet the delivery schedule for some petroleum-related projects, as well as the worsening performance of overseas group companies including one in England and the prolonged tumble in oil prices,” Chiyoda stated. “Under such circumstances, the group was concentrating on the initiatives designed to create sustainable growth,” Chiyoda said. The group said it had made progress toward this goal in winning new non-LNG orders in Saudi Arabia and Indonesia. “While keeping a

strong presence in the conventional field, the group also received a letter of intent for a liquefied natural gas plant, although it was subject to a final investment decision still to be made. In parallel, the group was set for expansion in new business fields including offshore and upstream where Chiyoda Subsea was established to implement an engineering, procurement, construction and installation (EPCI) business,” it added. Consolidated new contracts for the period amounted to 403.59Bln yen (\$3.7Bln), a fall of 46 percent compared with fiscal 2015. Chiyoda said its backlog amounted to 1.6 trillion yen (\$10.7Bln), a decrease of 17.8 percent from the end of the previous fiscal year. “With great regret about lower earnings, the group is aiming to strive to improve profitability, and recover stakeholders' trust by performing more rigorous management for profit and loss and for the group,” it added.

CLEAN ENERGY Fuels Corp. of California was awarded a contract to provide liquefied natural gas to Hawaii Gas, the main utility serving the six islands of the State of Hawaii. “The agreement is consistent with the state’s intent to reduce its reliance on imported crude oil, using a cleaner and more economical fuel,” Clean Energy said. It is the latest agreement signed by Clean Energy as it builds its LNG portfolio for LNG fueling throughout the United States. “Hawaii Gas has been serving the state for over a 100 years and is committed to providing our customers with quality and reliable gas service,” said Thomas Young, Hawaii Gas’s Executive Vice President and Chief Operating Officer. “With Clean Energy LNG, we will be able to diversify our gas supply using a clean fuel improving our reliability and maintaining the quality of service our customers know us for,” Young added, Hawaii Gas imported the state’s first ever LNG shipment in April 2014 in a 40-foot International Organization for Standardization (ISO) container aboard a conventional cargo ship sent from California. Then the LNG was regasified using a mobile vaporization unit and injected into the distribution pipeline, which serves residential and commercial customers. Hawaii Gas is now seeking more permanent LNG regasification facilities and supplies. The company has been working with key stakeholders on developing a comprehensive LNG plan for the state. The parent company of Hawaii Gas is New York-based Macquarie

Infrastructure Co. Hawaii Gas itself is a producer and distributor of synthetic natural gas (SNG) and a distributor of liquefied petroleum gas (LPG) on the islands of Hawaii. It owns and operates an SNG plant and more than 1,100 miles of pipeline serving about 35,000 household and business customers. The utility serves an additional 34,000 non-utility customers via on-site propane tanks or portable gas cylinders. Macquarie indicated last year that Hawaii Gas would expect to begin regular LNG shipments around the end of 2018, though ISO tanks can be imported at any time before any Floating Storage and Regasification Unit is deployed for imports in greater bulk.

DOWNEAST LNG’s export-import project planned for Robbinston in the northeast state of Maine is being put up for sale and is unique in America in that the inhabitants of the location have already voted by a big majority in a town election to back the LNG venture. The Downeast project is being sold by Yorktown Partners, a private equity investment firm. George Petrides, chairman of Downeast LNG, said the company’s board and shareholders had decided to put the company up for sale as of July 1, 2016. The main planning proposal for Downeast LNG is to construct a 3 million tonnes per annum LNG export facility on Passamaquoddy Bay in Maine, near the Canadian border. “We have reviewed our strategy and decided that an industrial player or a specialized investor such as an infrastructure fund is better suited to continue the permitting process and eventual build-out of the project,” Petrides explained. The Downeast import-export project in March 2015 was awarded an export permit for Free Trade Agreement countries such as those in the Caribbean and Latin America by the US Department of Energy. The DoE issued the licence for 20 years for around 3 million tonnes per annum of LNG to the venture located just across the border from Canada. The Downeast venture, one of only three export projects that were planned for the US East Coast, intended to use feed-gas from both the US and Canada. The developers first raised the possibility about nine years ago of building an import terminal for New England but did not proceed because of the shale-gas boom. Downeast’s last development plan was to convert its proposed LNG import terminal and send-out pipeline project into a bi-

directional import-export LNG plant. When the Downeast project was first put forward solely as an import venture around 2005 it attracted opposition not only in Maine, but from across the Canadian border in the province of New Brunswick. However, in January of 2006 the people of Robbinston voted 227 to 83 in support of the Downeast project in a special town election.

DRIFTWOOD LNG, a US export development company owned by former Cheniere Energy Chief Executive Chafir Souki and ex-BG Group LNG chief Martin Houston, has filed an initial plan with regulators for their proposed export facility on the US Gulf Coast to produce 26 million tonnes per annum. Driftwood is a subsidiary of Tellurian LNG, founded by Souki, after he was fired by Cheniere, and by Houston who had been planning his own export ventures with a company called Parallax Energy. The Souki-Houston export facility is proposed for the west side of the Calcasieu River near Carlyss in Calcasieu Parish, Louisiana, along with a related 96-mile pipeline project, according to their filing with Federal Energy Regulatory Commission. “Driftwood LNG will work collaboratively with the Commission and interested federal, state, and local agencies to obtain all necessary permits and authorizations, and will also proactively engage in public outreach activities to disseminate information and updates about the project to interested members of the public,” the company said in its FERC filing. After receiving all necessary permits, Driftwood LNG told the regulator it intended to start construction in the

second quarter of 2018. The Souki-Houston company said it planned to have its first LNG processing Train on stream by the second quarter of 2022. The FERC

filing is signed by Houston with his title given as President of Driftwood LNG. The target date for completion of construction of the Calcasieu River facility and for the

entire project to be operational is 2025. The project plans to have four storage tanks on site, each with a capacity of around 175,000 cubic metres. Driftwood



LNG VALUE CHAIN



The diagram illustrates the LNG value chain. At the top, an oil rig and a ship are shown. Below them, a train and a truck are depicted. The central part of the diagram shows a large green rectangular area with a white truck and a white train. Below this, a green circle contains a white truck and a white train. The bottom part of the diagram shows a green circle with a white truck and a white train. The entire diagram is set against a light blue background.

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LNG is aiming to match the capacity of Cheniere's Sabine Pass LNG plant, whose development was masterminded by Souki only for him to be sacked months before the plant started shipping its first cargoes in February 2016. The Driftwood developers also told the FERC they would partner with US engineering firm Bechtel to construct the plant and had selected Chart Industries for liquefaction technology. "The facility site will cover an area of approximately 800 acres," the FERC filing said. "At this time, Driftwood LNG has purchased 140 acres and has leased an additional 475 acres of the facility site with the right to enter into a long-term lease for up to a total of 50 years," the company added. Souki's Tellurian company has also revealed details of his departure from Cheniere. Tellurian cited a recent television interview he gave to confirm his departure from Cheniere in December 2015 was due to a difference with the board, including the newly-installed board member Carl Icahn, the US billionaire investor. Since that time, Souki has teamed up with Houston, the former Chief Operating Officer of BG, in the Tellurian company. When Souki left Cheniere it also impacted Houston, whose Parallax company was planning LNG joint ventures with Cheniere. "Not only did the board decide and Mr. Icahn decide that they didn't want to do what I wanted to do, they also didn't want to continue to fund Martin. So, they made both of us free agents," Souki stated.

EAGLE LNG said it had started the construction of its Florida liquefaction plant in the port city of Jacksonville to supply the marine fuels market and other sectors from 2017. Eagle said the facility would have an initial production capacity of 87,000 gallons per day and rising to 200,000 gallons per day. The plant will be a main supplier to Crowley Maritime Corp. for its new LNG-powered Commitment Class ships trading from the US mainland to Puerto Rico. The facility has production capacity beyond Crowley's needs which will be available for sale to both domestic clients in the US southeast and to Caribbean island customers looking for containerized LNG supply. The Eagle plant will also have storage for a million gallons of fuel and loading facilities for trucks and International Standardization Organization (ISO) containers. Eagle emphasized that the fuel plant was a different project from the company's

previously announced Federal Energy Regulatory Commission-regulated export venture located along the St. Johns River in Jacksonville. This venture is also going ahead and will continue to focus on the export markets in the Caribbean and Atlantic Basin along with providing additional domestic supply. To support the fueling of ships, Eagle is also building a dockside depot at the Talleyrand Marine Terminal on the St. Johns River. Eagle is a wholly owned subsidiary of Ferus Natural Gas Fuels and the privately-held Energy & Minerals Group. John Hourihan, senior vice president and general manager of the Puerto Rico services of shipping line Crowley, said the venture was important for the Northeast Florida region as a whole. "Having reliable access to sufficient quantities of LNG will be essential to our operations as we introduce our new LNG-powered Commitment-Class ConRo (container/roll-on roll-off) ships to the Puerto Rico market next year. The facility will also afford us the opportunity to export LNG in ISO tanks to customers in Puerto Rico and the rest of the Caribbean Basin, something we are already doing with LNG sourced from outside of Florida," Hourihan explained.

FLOGAS Britain, the liquefied natural gas provider for commercial and industrial customers, has signed a landmark deal with UK gas distribution company SGN to supply LNG to an independent grid system that serves four Scottish towns lying outside the national gas network. Flogas, based near the city of Leicester in central England, said it signed a five-year accord to supply 10,000 tonnes of LNG a year to the system that provides natural gas to the towns of Oban and Campbeltown on the west coast of Scotland and to the northern Scottish towns of Thurso and Wick. The deal will see Flogas supply the fuel sourced from the UK's largest import terminal on the Isle of Grain in Kent. The regasified LNG will be fed directly into SGN pipelines serving the towns. LNG was previously supplied from the peak-shaving and storage site at Avonmouth in southwest England which, after 40 years of operation, has recently been decommissioned. The UK's five peak-shaving facilities, owned by National Grid, were at Glenmavis, Partington, Avonmouth, Dynevor Arms and Isle of Grain. They have all now closed commercial operations, while Grain LNG alone was expanded into an import

terminal. The four Scottish towns are served by around 90 kilometres of local pipelines supplied with the regasified LNG. The towns are not physically connected to SGN's main distribution network and the LNG will be transported north by truck. The LNG had previously been sourced from the Glenmavis LNG peak-shaving plant in central Scotland and then transported by trucks to smaller local storage sites. Avonmouth and Partington had previously acted as back-up sources whenever Glenmavis was unable to provide LNG to the Scottish towns. Joel Martin, Regulatory Finance Manager at SGN said: "With Avonmouth closing, we had to find an alternative solution for our customers that are connected to the LNG-fed Scottish Independent Undertakings. Following a competitive tender, it was Flogas's pricing, infrastructure and professionalism that led us to choose them for our supply. They have an extremely well-developed LNG network, are market leaders, and we trust them completely to provide us with an uninterrupted supply of LNG at a competitive price." Head of Sales at Flogas, Rob McCord, said: "We're delighted to be working with SGN. The deal will see two large, successful companies coming together to fill the gap created by the Avonmouth closure. We've invested heavily in LNG, spending millions on a new (trucking) fleet, a specialist LNG team, and dedicated LNG fleet scheduling. The result is that we have the most comprehensive LNG network in the UK." The supply to SGN will also be greatly enhanced by an agreement Flogas has just reached with Grain LNG, the Kent import terminal that is a subsidiary of National Grid. The agreement has seen Flogas secure 1,000 commercial truck loading slots at the Grain LNG facility, making it the largest ever commercial slot arrangement signed by the terminal.

FREEPORT LNG, the export project led by US energy entrepreneur Michael Smith at Quintana Island in Texas, is progressing smoothly, including current work on dredging the original marine basin at the existing import terminal. The dredging is needed to accommodate a second ship dock. Expansion dredging of the dock basin began in early February 2016 and comprises two vessels. When completed the Freeport facility will be able to welcome the world's largest LNG carriers, such as the Qatari Q-max, as

well as the optimum-designed vessel of just over 170,000 cubic metres capacity to transit the Panama Canal with LNG for Asia. The size of the original basin didn't allow tankers at two berths simultaneously, as they would be too close for safe operation. "People don't know what goes into making sure that a transit is done safely and all the efforts we do to make sure that everybody signs off on it," said Tony Galt, Freeport LNG Marine Operations Manager. "There are all kinds of checks and balances to make sure that when one does come in, it's been properly vetted and there's been sufficient training. There'd be too much risk to do it otherwise," Galt added. Each of the three Trains in the first phase of construction at Freeport will produce just over 5 million tonnes per annum of LNG and 13.4 MTPA of the more than 15 MTPA of output has been contracted under use-or-pay liquefaction tolling agreements. A fourth production Train is also planned. Construction work on the additional Train is expected to begin in 2017 and to be operational in 2021. Existing buyers of the Freeport capacity include BP of the UK and Japanese utilities Osaka Gas and Chubu Electric Power. BP has signed a contract for 4.4 MTPA of liquefaction capacity. "On completion of the work, the original berth will be able to accommodate 1,135-foot Q-Max tankers, but the new berth will be constructed to accommodate vessels 1,035 foot long, carrying cargoes of up to 180,000 cubic metres of LNG," the company said. The expansion of the dock basin has enlisted the feedback and services of a number of partners. The original expansion plans were adjusted with advice from the local Pilots Association and the US Coast Guard. "The layout of the berth was changed from a triangular shape to one where the ships would have a parallel orientation and a safer 600-ft 'skin-to-skin' distance between ships at the docks," the company explained. "Also, a small rock jetty would be added to encourage the falling tide current not to sweep into the basin while a ship was entering," it added. A small dredge performed a silt maintenance dredge in the original basin, removing accumulations of silt from the Dock 1 area. A larger dredge, the "Captain Frank", worked to excavate space for the second ship dock. "The two dredging operations differed in respect to spoils disposal as well," the company explained. "The smaller maintenance dredge deposited its material on Quintana Island in a catchment area between the marine

basin and the terminal's air tower. Containment levees were constructed here to keep dredge soils from the dock basin. The larger dredge, working to increase the basin's size and depth, deposited its spoils in an offshore area designated by the Environmental Protection Agency. This material was primarily dense clay. The clay was broken up by the dredge's auger-type cutter head and pumped up through a pipe and deposited into a transport scow, a large open-topped barge," the company explained.

GASLOG, the Monaco-based owner and operator of 26 LNG carriers, swung to a net loss in the first quarter of 2015 as its latest ship, "GasLog Greece", was delivered and put on a long-term charter to Royal Dutch Shell that will help underpin revenue flow. The latest charter had previously been negotiated with its main customer BG Group, whose position has now been taken over by Shell after their merger. "During the quarter, we took delivery of the 'GasLog Greece', the first of the eight newbuilding vessels we have on order," said Chief Executive Paul Wogan. The 174,000 cubic metres capacity vessel has tri-fuel diesel-electric propulsion and was constructed by Samsung Heavy Industries of South Korea. The delivery of this vessel means GasLog has 19 ships on the water and the others on order. "This vessel has a 10-year charter contract with a subsidiary of Shell and is one of seven vessels with multi-year contracts due to be delivered between now and 2019. All eight vessels have committed bank financing. Through these long-term charters with Shell, GasLog has contracted revenue for 74 percent of the available days through to the end of 2018, giving significant revenue and cash flow visibility," Wogan stated. The company said it was also looking at converting some of its LNG carriers to floating LNG storage and regasification units (FSRUs) and to this end has initiated a front-end engineering design conversions study with Keppel Offshore and Marine of Singapore. During the first three months of the year, GasLog posted a net loss of \$5.4 million compared with a net profit in the same 2015 period of \$13.9M. It also managed to sign a \$575.2 million refinancing in April 2016 for all of its 2016 and 2017 debt maturities. Additionally, GasLog completed the sale and leaseback of the LNG carrier "Methane Julia Louise" with a subsidiary of Mitsui & Co. The vessel

was sold to Mitsui for \$217M in cash. GasLog has leased back the vessel under a charter from Mitsui for a period of up to 20 years, having a payment holiday for the first 210 days. GasLog has the option to re-purchase the vessel on pre-agreed terms no earlier than the end of year 10 and no later than the end of year 17 of the charter. CEO Wogan said one of the other highlights of the first quarter was completing two major financing transactions in recent weeks, meaning the company has no debt maturities until 2018 and is focusing on extending those. "The short-term LNG shipping market continues to be challenging, with a number of vessels waiting to service projects that have either been delayed or out of action in recent months," Wogan added. "The presence of these vessels in the spot market has resulted in low levels of overall fleet utilization and low rates, a situation which we believe will start to improve as additional production from Australia and the US ramps up through the rest of the year. The long-term supply and demand outlook for LNG shipping remains positive, especially given the lack of new orders, which reinforces our view that we will see a future shortfall of vessels required to transport the new volumes," Wogan stated. GasLog has five newbuilds on order at Samsung and two newbuilds on order at Hyundai Heavy Industries. The delivery dates for the seven vessels are between this current second quarter of 2016 and the first quarter of 2019.

GAZTRANSPORT and Technigaz (GTT), the French owner of liquefied natural gas maritime and other storage tank technologies, has signed a contract to train personnel to operate the first LNG bunkering barge to operate in the US. GTT said it would train those who will be operating and handling LNG from the 2,200 cubic metres capacity barge using its technology and under construction at Conrad Industries Shipyard in Orange, Texas. The contract was signed with US shipping line Totem Ocean Trailer Express (TOTE), owner of the bunkering vessel. The Texas shipyard building the LNG bunkering barge is located on the Sabine River about 37 miles from the Gulf of Mexico. The barge will eventually be relocated to Jacksonville in Florida to serve parent company TOTE's Marlin Class dual-fuel container vessels and other LNG-powered ships in the Port of Jacksonville. GTT said the program to be carried out by its training unit would



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cover the LNG barge crew and that of an associated tug. The course will be the subject of US Coast Guard approval. “At present, there are no LNG specific competency and training standards for LNG barges that can serve as the basis to establish crew credentials and qualifications by the Flag authorities,” GTT said. GTT will collaborate with the STAR Center, an internationally recognized and USCG-accredited LNG training center located near Miami, Florida. “We are excited to partner with GTT and other stakeholders in developing a training program that sets the standard for safety when working with LNG,” noted Peter Keller, Executive Vice President of TOTE. Philippe Berterottière, Chief Executive of GTT, commented: “We are proud and honored by this agreement with TOTE. It demonstrates GTT group's capability to provide TOTE a wide range of services, beyond the containment system technology, to assure their personnel are certified and competent to safely conduct all operations related to the LNG bunker barge.”

GOLAR LNG Partners, the US-listed unit of the Norwegian fleet owner and project developer, completed an \$800 million loan deal to help finance seven vessels it has acquired as well as a new ship, the Floating Storage and Regasification Unit that will act as an import facility in the western African state of Ghana. The credit facility is over a period of five years and will go towards refinancing its existing set of loans. “The new credit facility consists of a \$650 million term loan and a \$150M revolving credit facility which together refinanced the existing credit facilities that were secured by seven vessels in the partnership's existing fleet and also provided part of the funding for the acquisition of the ‘Golar Tundra’,” Golar stated. Golar said it had completed the ownership transfer of the 170,000 cubic metres capacity FSRU “Golar Tundra” from its affiliate Golar LNG Ltd. for \$300M. Golar LNG formed its partnership to list on the Nasdaq stock exchange as a spin-off and for tax purposes in 2011 when the company was still controlled by Norwegian shipping tycoon John Fredriksen. The FSRU is the latest ship to be transferred at a price from Golar LNG Ltd. to the US partnership. 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. The Ghana project's charter contract with Golar will be for an initial period of five years with the option for WAGL to extend for a further five-year term. The FSRU “Golar Tundra” was recently completed by the Samsung Heavy Industries shipyard in South Korea. The vessel is scheduled to be delivered to Ghana in the second quarter of 2016 following some minor modifications to be carried out at the Keppel shipyard in Singapore. This is Golar's third Western African LNG project, though the other two are for production rather than imports and regasification. The company will provide a liquefaction hull for a Floating production venture in Equatorial Guinea being developed by UK company Ophir Energy. Golar is also behind plans for LNG production in Cameroon. It is providing an FLNG hull as a liquefaction plant to be deployed over the Kribi natural gas field offshore Cameroon.

GOLAR LNG Ltd, the Norwegian owner of LNG carriers and Floating Storage and Production Units as well as developing production hulls, has overhauled its management and replaced Chief Executive Gary Smith. Golar, founded in Norway and now based in Hamilton, Bermuda, said it was adapting to industry changes by changing its strategy. The company said Smith had resigned from his position and been replaced by Oscar Spieler, who has been responsible for the conversion of the former LNG carrier “Hilli” into a floating production hull to be deployed offshore West Africa. “Smith who was also Golar's CEO between March 2006 and July 2009 was re-hired as a consultant in 2014 to assist Golar in developing the LNG shipping business,” Golar explained. “He was promoted to Chief Executive in January 2015. Mr Smith has an excellent standing within the LNG industry and has contributed positively in the process of developing Golar into a midstream LNG player. The board wish him well in the future,” it added. Golar said the organizational changes were made to meet new challenges and “better align technical and operational activities which are based in Oslo”. The LNG industry is going through a rapid transformation where monetization of stranded gas is lowering the cost of LNG production and the opening new markets that will be critical success factors,” Golar said. “An anticipated delinking of LNG prices from oil prices will also create additional

demand for LNG. The traditional approach to executing LNG projects favoured by many oil majors may not cost effectively meet this new demand. The board of Golar has therefore decided to promote strategic organizational changes to ensure that the company is positioned to meet this demand,” it stated. New CEO Spieler had also previously been the company's CEO between July 2009 and June 2011. A naval architect by profession, Spieler has strong leadership skills and a long track record of successfully delivering advanced offshore and shipping related projects. “Spieler has work experience from Bergesen, DNV and 16 years in the John Fredriksen-controlled Seatankers Group where he had several functions including CEO of Frontline, Golar, Sea Production and Sea Lift,” Golar explained. In another management move, Golar said Doug Arnell who was CEO of the company until January 2015 remains as a senior advisor and will assist Spieler “to ensure strong leadership” of Golar's commercial activities. “Mr Arnell has a significant background in LNG commercial activities through his leadership roles at companies including Enron and BG Group in addition to Golar,” it added. “Most recently he was instrumental in the successful development and structuring of the Cameroon FLNG Export Project,” Golar said. The company additionally stated that it had hired Krzysztof Zielicki to structure the cooperation with energy services company Schlumberger. Zielicki was formerly Global Head of M&A and Strategy at Russian energy company Rosneft. “He has a degree in quantum mechanics from the University of London and holds several post graduate diplomas. Prior to his involvement in Rosneft he spent 25 years in BP and was also Vice President of Development at TNK-BP,” Golar said.

GORGON LNG, the US\$54 billion project on Barrow Island offshore Western Australia, is beginning its re-start process after being shut by a technical fault just after shipping its first cargo in March 2016. The plant, operated by Chevron Corp and with Royal Dutch Shell and ExxonMobil as the other shareholders, is set to load its second cargo in the next couple of weeks. When finally completed it will operate three liquefaction Trains with total output of 15.6 million tonnes per annum. The shutdown was caused by a faulty propane refrigerant circuit on Gorgon's first LNG

processing Train. “Start-up activities are under way on Gorgon Train 1 with a plan to safely resume production in the coming weeks,” Chevron said. The company added that construction activities continued to progress on Trains 2 and 3, with timing not affected by the repair work on Train 1. The nameplate capacity of each Train is 5.2 MTPA. The first cargo had been shipped from Barrow Island on March 21. The first commissioning process cargo was delivered to one of Chevron's foundation buyers, Chubu Electric Power Co. of Japan on the new 160,000 cubic metres capacity Chevron carrier “Asia Excellence”. Chevron then admitted the second shipment of LNG from Barrow Island would be delayed from the plant that is Australia's costliest ever resources project and one of its most complex in terms of engineering. Analysts pointed out that start-up problems are not uncommon with LNG plants. They are usually brought on stream slowly so that critical equipment can reach proper temperatures to handle the fuel safely and efficiently. The Gorgon project is supplied with feed-gas from the Gorgon and Jansz-IO gas fields, located within the Greater Gorgon area, up to 136 miles (220km) off the northwest coast of Australia. The venture includes the liquefaction plant as well as a carbon-dioxide injection project and a domestic gas plant to supply the Western Australia market. With the commercial start-up in March, the Gorgon venture was a year behind the original schedule and well over budget, because of its complexity as a construction project and the environmental challenges. The original budget for Gorgon was US\$37Bln when it was first given the go-ahead and costs have risen by US\$17Bln to US\$54Bln. The Gorgon joint venture partners also have a permit for a fourth Train expansion, improving the long-term project economics with 5.2 MTPA of additional cargoes. Chevron is also developing the Wheatstone project and a domestic gas operation near Onslow, in the Pilbara region of Western Australia. The Wheatstone venture, with Australia's Woodside as a partner, will have an initial capacity of 8.9 MTPA of LNG and is expected to come on stream by 2018.

JAPANESE LNG imports dropped 3.3 percent in April after edging higher the previous month, though the nation's other overseas fuel purchases plunged even lower by double-digit amounts. The April deliveries of LNG to Japan amounted to

6.38 million tonnes compared with 6.59MT in April 2015, according to the preliminary trade statistics from the Ministry of Finance. LNG imported by Japan for gas-fired fuel generation still fared better than other generating fuels, with thermal coal imports down 16.3 percent to 7.56MT and oil shipments to Japan plunging 21 percent in April. Japanese LNG imports had actually risen by a marginal amount in March 2016 for the first time since August 2015, to 8.14MT compared with 8.13MT in March last year, a rise of 0.1 percent. The latest LNG import figures also illustrated the falling price of LNG with deliveries in April 2016 costing 232 billion yen (\$2.17Bn), down 44.5 percent, compared 417Bn yen (\$3.7Bn) in the year-ago period. Fewer cargoes were imported from the Middle East while Asian imports rose 8.6 percent. The average price paid by Japan in April for cargoes was \$331 per tonne, or \$6.40 per MMBtu, compared with \$573 per tonne, or \$11.08 per MMBtu, in the year-ago period. Total shipments of LNG from the Middle East were down 19 percent. Shipments from countries like Qatar, the United Arab Emirates and Oman fell to 1.46MT in April. These were offset by Asian deliveries from nations such as Malaysia and Indonesia, Papua New Guinea and Brunei which amounted to 1.95MT. Russian imports were down more than 10 percent compared with a year ago at 662,000 tonnes. The balance of imports in the preliminary figures amounted to 2.31MT from other exporting nations such as Australia and Nigeria as well as the spot market. There were still no imports logged yet in Japan from the United States. Japan said earlier in May that the price of spot LNG cargoes imported into the country in April amounted to \$5.80 per MMBtu, down \$2.10 per MMBtu compared with the \$7.90 per MMBtu price in the year-ago period. The delivered price had amounted to \$6.80 per MMBtu in March compared with \$7.60 per MMBtu in the year-ago period as the worst effects of the oil slump began to level off in the market. The numbers come from the commerce division of the Japanese Ministry of Economy, Trade and Industry and are only issued if a minimum number of two trades are recorded. The ministry emphasizes that “spot LNG” refers to fuel traded on a cargo-to-cargo basis and does not mean shipments under contracts on a short-term, medium-term or long-term basis. Prices prior to averaging are all

converted into an equivalent Delivered Ex-Ship (DES) basis whereby the seller carries the cost of the shipping.

JGC CORP., the Japanese LNG engineering company that helped build the processing Trains in Qatar and is working on projects around the world including the US, is overhauling its strategy to better compete with its peers and part of the plan is to set up a European base. JGC, based in Yokohama, has competence in liquefaction plant building and has also constructed a third of Japan’s import and regasification capacity. Its “new horizon” programme is a medium-term plan to advance its business and compete better for LNG and energy contracts and boost earnings. “JGC presents a new corporate format as a Management Contractor & Investment Partner,” it said. “This goes beyond the framework of a conventional engineering contractors and sets numerical goals. JGC said that in addition to competing with its main rivals it also wants to cooperate more with them. JGC intends to actively promote a wide range of collaborations with Bechtel, Fluor, KBR, Technip and the South Korean firms, GS Engineering and Construction and SK E&C, and domestic engineering companies that have joint-venture experience for EPC implementation,” it said. The Japanese company also intends to create a European site for global operations with three main centres. “JGC considers it needs an engineering site in Europe to address markets in the Middle East, North Africa and Russia as it promotes the market expansion strategy,” it stated. “It intends to create a new engineering site in Europe, in addition to the existing Japan headquarters in Yokohama and JGC America in the United States, for the establishment of operations at three sites worldwide covering a wide range of markets,” it added. JGC also aims to compete in terms of sales and earnings. It put the sales levels of the top global engineering contractors as: Bechtel at 4 trillion yen (\$36 billion), Fluor at 2 trillion yen, and Technip, CB&I of the US and Italy’s Saipem each at 1.5 trillion yen. “JGC must pursue further expansion of sales, profits and other business values in order to genuinely put itself on the same footing as these firms,” it said. The new JGC plans calls for 1 trillion yen (\$9Bn) in annual sales and 60 billion yen in net profit from fiscal 2020. JGC said it had expanded order values and sales in recent years but not at the pace it expected,

“given the advances by the hydrocarbons market, including sustained high crude-oil prices supported by economic growth in emerging countries and a rise in LNG projects. All of this was against the backdrop of rapid advances in the development of shale gas,” JGC said. It described the business plan as a first phase five-year growth strategy that clarifies the direction and business areas of the group over the next 10 years to 2025. “JGC has mainly operated until now in the EPC business for downstream hydrocarbon energy plants, but believes it is vital to broaden business scope, similar to global top contractors such as Bechtel, Fluor, and Technip, in order to achieve further growth and expansion,” it stated. “The plant market currently faces very difficult conditions because of the sharp decline in crude oil prices since two years ago and the resulting cutbacks of capital investments. However, the expansion trend for hydrocarbon energy demand driven by growing populations and economic advancement in emerging countries has not changed from a longer-term perspective. JGC expects a return of full-fledged capital investment in tighter supply-demand conditions for crude oil,

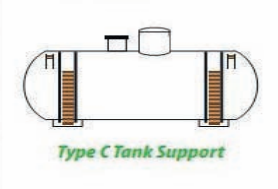
LNG and other energy sectors and the recovery of the plant (construction) market from the latter half of the new medium-term plan,” JGC stated.

JORDAN and the Egyptian Ministry of Petroleum have signed an expansion of the Middle East region’s first liquefied natural gas-sharing agreement between floating LNG terminal operators. A memorandum of understanding has just been signed between Egypt and Jordan for the use of more excess capacity by the Egyptians from Jordan’s LNG import facility at the port of Aqaba in the form of the Floating Storage and Regasification Unit (FSRU), the “Golar Eskimo”. An initial agreement was signed in September 2015. Egypt had previously booked 200 million standard cubic feet per day of regasified LNG from the FSRU in Jordan and now it will take any excess capacity from the 500 mmscf/d of regasified LNG from the FSRU in Jordan that is linked to the Egyptian gas pipeline network. Jordan, which counts Royal Dutch Shell among its LNG suppliers, previously received pipeline supplies from Egypt. However, as the Egyptian domestic demand has soared in recent years, the trans-Sinai pipeline to










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Egypt and Israel was continually sabotaged and the Jordanians sought stable gas supplies with LNG. From later in 2016 Jordan will also receive pipeline natural gas from Israel to fully replace Egyptian supplies. Jordan became the fourth Arab nation to deploy an FSRU as an import facility when the “Golar Eskimo” was deployed at Aqaba on May 25, 2015. Kuwait was the first Arab nation to import LNG through an FSRU terminal in 2009, followed by Dubai's FSRU that started imports to the United Arab Emirates in late 2010. The Egyptians began their LNG imports just before Jordan in 2015 through the “Hoegh Gallant” FSRU charter. Egypt's FSRU completed commissioning tests in April 2015 and started commercial operations at the Egyptian port of Ain Sokhna in the Gulf of Suez. That facility has since been joined at Ain Sokhna by a second FSRU provided by BW Gas of Singapore. The BW GAS vessel is named “BW Singapore” and allows Egypt to further increase its natural gas supplies to support more demand. Much of the natural gas consumed in Egypt is used to fuel electric power plants. The Egyptian government has also launched a campaign to encourage households, businesses and factories to switch to natural gas as a substitute for petroleum products and coal.

JOVO GROUP, the Chinese energy distribution company and a liquefied natural gas import terminal owner in the southeast Guangdong province, has signed a supply agreement with the Monkey Island LNG export project in Louisiana being developed by a former US telecoms operator. The privately-held Jovo Group owns the Dongguan import terminal which came on line in 2013 and has two storage tanks, each with a capacity of 160,000 cubic metres. Jovo also has an established presence in the Chinese market for liquefied petroleum gas (LPG) as well as other businesses. The Chinese accord is with the US LNG development company led by Chief Executive Greg Michaels and known as SCT&E LNG, under the name of the originally established Southern California Telephone Company, a privately-held United States Public Utility. The original Michaels company, Southern California Telephone, now does business as Southern California Telephone & Energy (SCT&E), to signify its move into LNG and natural gas. The LNG agreement was signed by Jovo Chairman Zhang Jianguo and SCT&E LNG CEO Michaels in New York during a

China-US Economic and Trade Cooperation Conference. The SCT&E project site is located on Louisiana's Calcasieu Ship Channel and plans to produce 12 million tonnes per annum of LNG. It is located about 2.5 miles inland from the Gulf of Mexico and with a building area on the island of 245 acres. “The agreement between SCT&E LNG and the Jovo Group represents a positive step forward for the region in meeting its country's national air quality standards,” a joint statement said. The Chinese company may also consider an equity investment in the US liquefaction and export plant. The SCT&E LNG business model seeks to export LNG via take-or-pay tolling agreements and is focused on supplying LNG to meet customer needs during what it sees as a “second wave” of LNG demand in 2022 and beyond. In 2015, SCT&E LNG signed two Memoranda of Understanding (MOUs) for a total of 1.7 million tonnes per annum of LNG and the company signed a third MOU earlier in 2016, though it didn't disclose the names of the other parties.

KOSMOS ENERGY, a US exploration and development company based in Dallas, Texas, said it was pushing ahead with its plans for a liquefied natural gas project in West Africa using its feed-gas discoveries offshore Senegal and Mauritania. Kosmos Energy, a company listed on the New York Stock Exchange and with operations centred in Africa, gave an update on its activities in its latest earnings for the first quarter of 2016. “Kosmos continued to build momentum in the first quarter,” said Andrew G. Inglis, Chairman and Chief Executive officer. “With the announcement of our Teranga-1 result in Senegal we continue our exploration success in opening a world-class basin offshore Mauritania and Senegal. We completed our appraisal drilling of the Tortue West discovery and delineated a world-class LNG resource with fewer wells than anticipated,” Inglis added. Kosmos said in January 2016 that the Guembeul-1 well, located in Senegal and five kilometres south of the Tortue-1 well, made a significant natural gas discovery, extending the Tortue West discovery into Senegal. In March 2016, Kosmos announced that the Ahmeyim-2 well, located about five kilometres northwest of the Tortue-1 well offshore Mauritania had successfully delineated the Tortue West gas field. “The results of both wells resulted in an increase in the discovered

resource of Tortue West and the Greater Tortue Complex, and based on these results the appraisal drilling of the Tortue West structure was concluded,” Kosmos said. The Texas company added that it exited the first quarter of 2016 with \$1.5 billion of liquidity and \$826 million of net debt. This compares to \$1.8Bln of liquidity and \$614M of net debt at the end of December 2015. In its first-quarter earnings, Kosmos said 2016 oil revenues so far were \$62M versus \$109M in the same quarter of 2015, on sales of 1.9 million barrels of oil for 2016 as compared to 1.9M barrels in 2015. The US company's Tweneboa, Enyenra and Ntomme (TEN) project, the second major oil development in Ghana, remains on-budget and is expected to deliver first oil in the third quarter of 2016. The LNG plans for Senegal and Mauritania by Kosmos is a success based on its strategy of exploration focused on frontier and emerging areas along the Atlantic Margin. Its current assets include existing production and development projects offshore Ghana, other large discoveries offshore Mauritania and Senegal, as well as exploration licenses with significant potential offshore Portugal, Sao Tome and Principe, Suriname, Morocco and the Western Sahara. Since 2012, Kosmos has held rights to conduct exploration in the C-8, C-12, and C-13 contract areas under production sharing contracts with the Government of Mauritania's national energy company SMHPM. Kosmos operates the Ahmeyim-2 well with 90 percent equity and SMHPM holds 10 percent. The Mauritanian blocks are in water depths between 1,000 and 3,000 metres and have combined acreage of around 27,000 square kilometres. West Africa, where Nigeria has become the world's fourth-largest LNG exporter after starting its first processing Train on Bonny Island in the Niger Delta in 1990, is experiencing a surge in the development of LNG projects, even amid the energy downturn. A floating LNG export project is already being pursued by Ophir Energy of the UK in the waters of neighbouring Equatorial Guinea, a nation which already has an onshore production plant on Bioko Island. This has been in operation since 2007. Another FLNG export venture is being developed in neighbouring Cameroon by European energy company Perenco, Golar LNG of Norway and the African nation's state energy company Societe Nationale des Hydrocarbures. The Cameroon project is aiming for first cargoes by the second half

of 2017 from feed-gas in the Sanaga Sud and Ebome gas fields. Both the Cameroon and Equatorial Guinea FLNG projects will use converted LNG carriers being transformed into floating liquefaction and storage hulls at the Keppel Shipyard in Singapore.

KUNLUN ENERGY Co., a subsidiary of PetroChina, plans to sell upstream assets and may buy an LNG import terminal in northern China to go with the two it already operates and to expand its city-gas distribution business. Kunlun owns the import and regasification facilities at Rudong in Jiangsu province in eastern China and Dalian in northeastern China and it may now purchase the LNG terminal in Tangshan. “We've made it clear that we want to be a downstream-focused gas distributor in China, and we don't feel that carrying upstream oil and gas assets will help us fulfill that goal,” said Chairman Huang Weihe at the company's annual meeting of shareholders in Hong Kong. Kunlun also owns nine small-scale LNG liquefaction plants that enable natural gas distribution by trucks from areas such as Bayannur in Inner Mongolia, Fushan in Hainan, the Lunnan plant and the Guangan LNG plant in Sichuan province. PetroChina, the biggest domestic oil and natural gas producer, transferred its own domestic gas distribution company to Kunlun in November 2015 to help it expand city-gas sales and compete with rivals such as China Gas Holdings and ENN Energy. Kunlun owns nine oil and gas producing assets in China as well as six other countries, including Kazakhstan, Oman, Peru, Thailand Azerbaijan and Indonesia. As has happened to other energy companies, Kunlun's upstream assets began to lead to falling earnings since the oil price slump in mid-2014. Kunlun added that its fourth natural gas pipeline linking Shaanxi and Beijing will be completed before 2017. The company said it intended to keep its pipeline assets. Kunlun has also been developing LNG fuel use in China by implementing the “gas in substitution of oil” strategy. The company also promotes the use of LNG for shipping on the Yangtze River and the Beijing-Hangzhou Grand Canal. Additionally, Kunlun has sought to support and construct more LNG refueling stations across the country for heavy-duty trucks and other vehicles and has supported LNG public transport projects in the cities of Beijing, Chongqing, Haikou and Baoding.

MALAYSIA International Shipping Corp., the operator of a fleet of 25 LNG carriers, said that while it is a challenge to develop new LNG shipping contracts due to the depressed prices in the market, the group's present portfolio of long-term charters should help to underwrite a steady financial performance for the rest of the year. MISC made the statement as it posted first-quarter LNG revenue of 683.2 million Malaysian ringgits (\$170 million), a 2.1 percent rise on the 669.1M ringgits earned in the same quarter a year ago. The Malaysian shipping line is being helped by lifting cargoes from the Australian Gladstone coal-seam-gas-to-LNG plant in Queensland, where Malaysia's state energy company Petronas is a shareholder. The 152,000 cubic metres capacity MISC LNG carrier "Seri Bakti" was the first vessel to berth at the Gladstone LNG plant in September 2015 to carry out operational tests. This later resulted in the loading of one of the first LNG cargoes and its successful delivery to the Pyeongtaek import terminal in South Korea. Charters for GLNG have continued into 2016 and MISC has said it hoped to extend the relationship further. "LNG operating profit of 747.8M ringgits was higher than the corresponding quarter's profit of 360.2M ringgits, mainly from recognition of compensation for early termination of time charter contracts for two vessels," MISC said. "Barring any material cutback in global oil production, we expect the petroleum shipping segment to continue to benefit from robust demand for tankers, despite stronger growth in tanker supply in 2016," it added in regard to its oil and product tanker fleets. MISC said

that given that the outlook of the upstream oil and gas industry is projected to remain poor because of the prolonged weakness in oil price, the prospects of the

company's heavy engineering division "will remain very challenging." The company said overall group revenue was 2.39 billion ringgits (\$595M), a drop of 3.8

percent from the 2.49Bln ringgits of cash flow in the first quarter of 2015. MISC is majority-owned by Petronas and the energy company has 21 of its 25 LNG



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carriers on long-term charter. The shipping company should also benefit in the medium term from Petronas being at the forefront of floating LNG projects being developed for stranded gas fields in Malaysian waters. MISC's Puteri class vessels of 130,000 cubic metres capacity and numbering five ships are all around 20 years old but a recent renewal deal struck with Petronas has allowed a contract extension. Conditions of the extension require that each vessel undergoes a repair and life extension programme involving a comprehensive retro-fitting of equipment alongside containment analysis and enhancements to ensure each vessel remains fit for service. While Petronas will remain a core client, MISC has begun building relationships with other LNG companies. As a result, two of MISC's ships are now chartered to Yemen LNG, though that plant is currently closed because of the conflict.

MITSUI OSK Lines, the Japanese shipping line involved in operating about 70 liquefied natural gas carriers, said it had teamed up with Indonesia to bring small-scale LNG deliveries to the tourist island of Bali. The latest step in the development of its Asian LNG business was the chartering to subsidiaries of Indonesian energy company Pertamina of the small-scale LNG carrier. The carrier has started delivering LNG to Bali in a shuttle service from the main Indonesian liquefaction plant at Bontang in East Kalimantan. The chartered vessel is the 23,014 cubic metres capacity "Triputra". It has membrane-type LNG storage and recently discharged its first cargo at the Port of Benoa on Bali Island. LNG is being delivered to Benoa by the shuttle and unloaded into a floating storage unit (FSU). "This facility regasifies the LNG and pipes the gas to a power plant

on Bali," MOL said. "This is a groundbreaking project that pioneers a new mode of transport for natural gas," it added. This is the second coastal shuttle transport project following one serving West Java which MOL secured an order in 2011. "The charterer is working to establish a gas value chain with the new method of transferring LNG to an FSU moored at a pier," the Japanese company said. "Since 1986 when MOL established a joint ship management company with a local partner in Indonesia, it has focused on training Indonesian mariners. As a world-leading LNG carrier owner and management company, it takes a proactive stance in offering LNG transport services in Southeast Asia including Indonesia, where domestic demand is increasing for natural gas as a clean energy source," the company stated. The Indonesians have chartered the LNG carrier "Triputra" for seven years. The ship was built in the year 2000 and was formerly named the "Surya Satsuma". MOL has been instrumental in shipping LNG to Asia from all major producing nations, including Qatar. One of its most recently signed large-scale Asia-Pacific agreements was with US major ExxonMobil Corp. for the construction and chartering of a fleet of four LNG carriers that trade LNG from Papua New Guinea and Australia to China.

MOZAMBIQUE, the southeast African nation that was previously on track to develop liquefied natural gas projects from its world-gas reserves, is heading instead for a debt default amid a secret government loans scandal and delays of several years in moving forward with LNG ventures. The Mozambican debt crisis involves the government's failure to honour a sovereign guarantee behind a \$535 million loan taken out by a state-run company to build shipyards and

jetties to service the LNG industry that has not materialized and neither have the shipyards. LNG projects in Mozambique, led by Italy's Eni and Anadarko Petroleum of the US and with stakeholders including the largest LNG and energy companies in Asia, have been delayed by the reluctance of the government to bring in timely energy sector and investment reforms. The lack of government progress on reform and the sanctioning of LNG projects has been overtaken by the oil price slump, whereby the companies themselves are reluctant to move forward with uneconomic ventures in the current environment of low prices. Energy development projects in the offshore Rovuma Basin of Mozambique will also be challenging, given the deep waters where operations will take place and amid a lack of onshore infrastructure. Foreign creditors behind the loans to Mozambique, organized by Russia's VTB Bank, have declined the country's request to renegotiate payments and talks are reported to be continuing. US ratings agency Fitch downgraded Mozambique's credit rating on May 23 to "CC" from "CCC", indicating that "a default of some kind appears probable". In February 2016, the Mozambique authorities sanctioned the development of the first phase of the Coral Floating LNG project planned by Eni and targeting fields with 5 trillion cubic feet of natural gas. However, Eni is reluctant to move forward for now on Coral FLNG and is said to be seeking to sell more of its stake in its massive offshore natural gas discoveries in the Rovuma Basin. This follows the signing of a unitization and operating agreement by the two licence holders in Rovuma to cover gas straddling both licences for Eni's Area 4 and Anadarko's Area 1. Future developments will be jointly pursued by the Area 4 and Area 1 concessionaires, though a final investment decision relating to the Mamba field in Eni's operating area is not expected until 2017. Eni is the operator of Area 4 with a 50 percent indirect interest owned through Eni East Africa, which holds a 70 percent stake of Area 4. The other Area 4 concessionaires are Galp Energia, Korea Gas Corp. and the Mozambique state energy firm, each with a 10 percent stake. China National Petroleum Corp.'s PetroChina affiliate owns a 20 percent indirect interest in Area 4 through Eni East Africa. The shareholders in the Anadarko-led Area 1 licence include three Indian companies ONGC Videsh, Oil India and Bharat

PetroResources as well as Japan's Mitsui & Co. and Thailand's state-owned energy company PTT. The discovery for Eni's Coral FLNG venture is located in water more than 2,000 metres deep and about 80 kilometres offshore the northern province of Cabo Delgado. The Eni plan of development, the very first one to be approved in the Rovuma Basin, foresees the drilling and completion of six subsea wells and the construction and installation of a floating production facility with capacity for just over 3 million tonnes per annum of LNG.

NEXTDECADE, a company run by former Royal Dutch Shell LNG executive Kathleen Eisbrenner, has formally filed its applications with the regulators to build the Rio Grande LNG export plant near the port of Brownsville in Texas. The facility is expected to produce 27 million tonnes per annum of LNG from six liquefaction Trains and a final investment decision on the venture is scheduled to be taken in 2017. The Rio Grande plant would also have four 180,000 cubic metres capacity full-containment storage tanks. The site for the plant is located on the northern shore of the Brownsville Ship Channel. When completed Rio Grande LNG will be as big as the Sabine Pass plant, the first completed US export facility, owned by Houston-based Cheniere Energy and which began commercial operations in February 2016. The filing by Eisbrenner's company with the US Federal Energy Regulatory Commission also includes a permit application to build the Rio Bravo Pipeline, a 137-mile system that will provide the facility with its feed gas. "After a productive pre-filing with the FERC and extensive consultation and cooperation with the reviewing agencies and local communities, we are proud to have achieved this major accomplishment," said Eisbrenner, who is NextDecade Chief Executive. "Despite recent low oil and gas prices, we have found robust appetite for US LNG on a long-term basis all around the world. This interest reaffirms the price competitiveness of US LNG for customers looking to diversify their gas supply on a global level," said Eisbrenner. 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

Diary of events

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

14th World LNG Series: Americas Summit & Exhibition
June 7-10, 2016
Houston, Texas
USA
www.lngamericas.cwclng.com

APPEA Conference & Exhibition 2016,
June 5-8, 2016,
Brisbane Convention and Exhibition Centre, Brisbane, Australia
www.appea.com.au/event

November
European Autumn Gas Conference
Nov 15-17, 2016
World Forum, The Hague
The Netherlands
www.theeagc.com/

The RasGas Roadmap to Cleaner Air

1. Begin intensive 10-year emissions reduction programme by applying Low NOx combustion technology to the company's gas-fired turbines and boilers built before 2005.
2. Subsequently apply the same technology to all applicable combustion units.
3. Successfully meet emissions regulatory limits, as set by the State of Qatar's Ministry of Municipality & Environment.

From 2006 to 2016, RasGas reduced NOx emissions intensity by:

90%

RasGas Company Limited, one of the world's largest LNG producers, embarked on an emission reduction programme in 2007 to introduce low NOx technology to its turbines and boilers built before 2005.

RasGas implemented the programme to ensure affected combustion units would meet - and outperform - regulatory requirements set by the Ministry of Municipality and Environment.

In the 2014 PTAI* benchmarking report, RasGas' NOx emissions intensity (as a weight percentage of total intake) was better than the LNG industry average by 70%, with RasGas ranking top of the 14 benchmarked LNG companies.

With the completion of the NOx reduction programme in May 2016, RasGas is expected to reach an overall 90% reduction in its NOx emission intensity by the end of 2016 compared to 2006 levels.

*PTAI: Phillip Townsend Associates Incorporated

project developer. In November 2015, NextDecade announced that it had signed non-binding agreements for 14 MTPA of LNG with customers it declined to name from Asia and Europe. “Since then, that number has grown to 26 MTPA, demonstrating a continued desire for US-produced LNG from customers around the world, and specifically, a desire for LNG from the proposed NextDecade facility,” the company said.

OIL SEARCH LTD of Australia has agreed a \$2.2 billion takeover of InterOil Corp., increasing its stakes in the existing ExxonMobil-operated Papua New Guinea LNG plant and the proposed Papua LNG project led by French energy major Total after itself rebuffing an acquisition effort by Woodside Petroleum in 2015. Oil Search, with its base in the PNG capital Port Moresby and with a listing on the Australian Securities Exchange, said at the time it had its own strategy and sufficient funding to proceed on its own. The Oil Search acquisition of InterOil was mainly for its stake in the Elk-Antelope onshore natural gas fields in PNG, which could hold at least 6.2 trillion cubic feet of resources. “Obviously this is a difficult, challenging LNG market and the only ones that will succeed over the next four to five years are those with the lowest cost base with the highest returns,” said Oil Search Chief Executive Peter Botten after his company’s agreed bid. “We believe based on the track record in PNG that the ability to develop these fields in a cooperative way delivers us the best possible opportunity to build further world-class LNG projects in our region,” said Oil Search CEO Botten. InterOil CEO Michael Hession said his company had received a number of other potential proposals, but opted for Oil Search. InterOil is listed on the New York Stock Exchange as well as on the local PNG exchange. Oil Search offered 8.05 of its shares for each InterOil share plus a contingent value right tied to the size of the eventual reserves in the Elk-Antelope feed-gas field. Oil Search said the offer valued InterOil at \$40.25 a share, a 27 percent premium to its closing price on May 18. As part of the plan, Oil Search has agreed to sell more than half of InterOil’s stake in Papua LNG to Total. As a result, Oil Search will end up with a 29 percent stake in the Papua LNG project, complementing its 29 percent stake in ExxonMobil’s PNG LNG. Woodside Petroleum, Australia’s largest LNG

operator, in December 2015 formally withdrew its takeover proposal for Oil Search. The original bid was made on September 3 and was rejected by Oil Search within 10 days. Oil Search had a market capitalization of just over US\$8 billion when the Woodside bid was made and the Australian LNG company was valued at almost twice as much. The Papua LNG would be a second liquefaction plant for PNG. The venture has already agreed key sites, with the export plant to be located at Caution Bay, near the capital Port Moresby. Its central processing facility will be near the Purari River in Gulf Province, about 360 kilometres northwest of Port Moresby, and will be connected to the LNG facility by onshore pipelines and offshore pipelines to cross the bay to the capital.

RELIANCE Industries, the Indian conglomerate with domestic natural gas and US shale-gas interests as well as other businesses, said full-year revenue from the oil and natural gas segment dropped almost 35 percent to the equivalent of \$1.1 billion, reflecting the low commodity price environment. Reliance said that on the Indian domestic front its oil and gas revenues plunged 26.3 percent compared with the year-ago quarter. Fourth-quarter revenues for domestic exploration and production operations was 901 crore rupees (\$140 million) because of the decline in gas production from the Krishna Godavari-Dhirubhai 6 (KG-D6) block offshore the state of Andhra Pradesh in the Bay of Bengal. The KG-D6 block was Reliance’s first offshore gas field development and its first underwater discovery. “The fall in oil and gas production was mainly on account of the natural decline in the fields coupled with sand ingress in wells,” said Reliance. The company is led by billionaire Chairman Mukesh D. Ambani and is also involved along the energy chain as well as in the petrochemicals, synthetic fibre and textile sectors. In its latest energy sector earnings figures, Reliance said the KG-D6 field produced 330,000 barrels of crude oil and 31.1 billion cubic feet of natural gas in the final quarter of fiscal 2016, down 27 percent and 15 percent respectively year-on-year. “During the quarter, the Government of India issued notification on marketing including pricing freedom for the gas to be produced from discoveries in deep water, ultra-deep water and high pressure-high temperature areas,” Reliance said. “The

proposed guidelines would be applicable for all future discoveries as well as existing discoveries which are yet to commence commercial production,” the company noted. Reliance said fourth-quarter revenues for the oil and gas segment decreased 34.8 percent compared with the three months in 2015 to 1,638 crore rupees (\$244M). “The segment profitability was impacted by lower oil and gas price realizations and decrease in domestic upstream volume,” it added. The Reliance US shale operations were impacted by low commodity prices despite marginally higher volumes. Reliance has three joint ventures in the US Marcellus and Eagle Ford shale plays and has invested more than \$6Bln in the businesses. The company’s Marcellus shale holdings include a 40 percent stake in a partnership with US major Chevron Corp. and a 60 percent partnership with Carrizo Oil & Gas. It also has a 45 percent interest in a venture with Pioneer Natural Resources in the Eagle Ford play. “The decline in revenue was led by lower upstream production in domestic blocks coupled with sharply lower oil and gas prices in both the domestic and US shale segments,” Reliance said. The Indian company said its US shale-gas business suffered due to a sustained drop in benchmark prices, despite “strong operational trends” across its joint ventures. “The Eagle Ford basin remains one of the most competitive liquid shale plays in the US and is well positioned to overcome challenges of a volatile price environment. The company said the Reliance-Pioneer joint venture acreages are “at the core of Eagle Ford shale play and are competitively positioned” to ensure profitable development. “The Marcellus basin remains as one of the most competitive dry gas shale plays in the US and the two Reliance joint ventures are committed to pursuing profitable development when prices improve,” the company said. Reliance said its average gross production in its US shale operations was 1,252 million cubic feet equivalent per day (Mcf/d) in the fourth quarter, an increase of 2 percent compared with the year-ago quarter. Net sales volume (Reliance share) stood at 6 percent lower at 42.9 Bcfe in the fourth quarter. Proved shale reserves stood at 2.61 trillion cubic feet equivalent in fiscal 2015, compared with 2.95 Tcfe in 2014. “Reserve growth would have been strong but for a decelerated pace of development,” Reliance said. “The

business environment remains challenging given the strong macro headwinds. To overcome the challenge, the business is focused on lowering activity levels to conserve cash while retaining optionality and preparedness for ramp-up, when prices improve,” Reliance said.

SANTOS, the Australian energy company and major LNG stakeholder, said natural gas was the only fuel at present that could help clean up Asia and control carbon emissions, including in the region’s largest economy, China. The pledge was made by new Chief Executive Keven Gallagher in an address to the annual meeting of the company shareholders at its corporate base in Adelaide, South Australia. CEO Gallagher also said that a new management team of six would help move the company clear of the worst effects of the oil price slump. Gallagher spoke about the benefits of exporting LNG to the region from the three liquefaction plants where it has stakes, the Gladstone coal-seam-gas-to-LNG venture in Queensland, the Darwin LNG plant in Australia’s Northern Territory and the Papua New Guinea project. The company had earlier reported that the three plants delivered 56 LNG cargoes to Asia during the first quarter. Santos operates the Gladstone LNG plant, which recently started commercial operations on Curtis Island in Queensland after costing US\$18.5 billion to build. “I am genuinely excited by the opportunities within our asset portfolio to deliver real long-term growth, based on an increasing global need for cleaner energy,” the Santos CEO said. “Natural gas is the only fuel that can deliver reliable, cleaner and affordable energy to the world’s major developing economies, including China. For example, replacing 1 per cent of China’s coal-fired generating capacity with natural gas generation would save 35 million tonnes of carbon emissions per annum. This is equivalent to 6 per cent of Australia’s annual emissions,” he stated. “There is no question that lower oil prices have put significant pressure on oil and gas companies, including Santos. The 2015 financial results reflect the impact of low oil prices on our profits and on the value of our assets. Despite the pleasing production and a solid operating performance in 2015, Santos recorded an overall loss of A\$2.70 billion (US\$2.02Bln) following asset impairments of A\$2.8Bln. This is a

disappointing result, but it shows the stark reality that our business must be sustainable in a low oil price environment. Since joining the company in February, I have had a first-hand look at our major operating assets,” he said. “Last month, I announced a new executive team and a new organizational structure that involves a move away from geographic business units to create a single business: one Santos,” he said. “This means an asset-based management structure with strong technical capabilities in exploration, development and production. The CEO said the new management team had three priorities. The near-term strategy is clear: stabilize the business; reduce debt and put the right framework in place to become a low-cost, reliable and high-performance business,” Gallagher said. “This includes an assessment of targets in the Northern Territory and Queensland, and near-field exploration to deliver additional gas. The exploration team, led by Bill Ovenden, will do the hard technical work to define new resources that will ultimately provide backfill for existing infrastructure or that will be developed as new projects. Brett Woods, as head of development, will provide the necessary capabilities to manage sustaining capital and to deliver our development projects such as the opportunities in PNG, Darwin LNG backfill and the ongoing technical assessment of the Narrabri Gas Project,” the CEO said. “Vince Santostefano, as Chief Operations Officer, will build on the production success of 2015 and drive safe and low cost, reliable production across the business to maintain and increase our revenue stream,” he added. “John Anderson, as head of commercial and business development, will provide the necessary commercial capability and expertise that protects and increases our margins. John will look to reshape our portfolio and prioritise assets and opportunities. Our objective is to create a good balance of conventional and unconventional projects to provide more stable returns throughout the cycle,” he said. “The other Executive Committee members, Andrew Seaton and Angus Jaffray, will work with me to support Bill, Brett, Vince and John,” Gallagher added. “Our aim, is to be cash flow break-even at between US\$35-40 per barrel on a portfolio basis,” the CEO stated. “This will put Santos in the position where it has the flexibility to take advantage of future opportunities,” he said.

SHELL has taken delivery of a third liquefied natural gas-powered Offshore Supply Vessel (OSV) at Port Fourchon on the Louisiana Gulf Coast. The “Harvey Liberty”, chartered from specialist company Harvey Gulf International Marine, will join its sister ships, the “Harvey Energy” and “Harvey Power”. Shell Offshore said the three LNG-powered vessels will refuel from Harvey Gulf’s new LNG bunkering facility at Port Fourchon, where they will support Shell’s offshore platforms in the Gulf of Mexico, transporting supplies, equipment and drilling fluids. The latest LNG vessel was built by the Gulf Coast Shipyard in the US state of Mississippi. “The ‘Harvey Liberty’ highlights our efforts to grow LNG as a fuel in the transport sector, and is a welcome addition to our portfolio,” said Tahir Faruqui, Shell’s General Manager LNG North America. Harvey Gulf Marine’s Chief Executive and Chairman, Shane Guidry, added: “Harvey Gulf is excited to share these historical maritime events with Shell. This represents another significant step in the path for Harvey Gulf to establish itself as a leader in utilizing LNG as a marine fuel.” The “Harvey Liberty” and its sister ships run on 99 percent LNG and can operate for up to 15 days before refueling. The LNG-powered vessels provide vessel owners with an alternative fuel to meet sulphur and nitrogen oxide emissions regulations in the North American Emission Control Area. The “Harvey Liberty” is 302-feet long and operates on three dual-fuel engines supplied by Finland’s Wartsila. Shell is one of the largest global transporters of LNG on the oceans, with Shell Shipping & Maritime managing more than 40 LNG carriers. In the Netherlands, the Anglo-Dutch company is also planning to deploy a specialized LNG bunkering vessel in the port of Rotterdam with a capacity of around 6,500 cubic metres.

SHELL said its first-quarter LNG sales volumes were 12.29 million tonnes, putting the company on track for around 48MT of LNG sales for the whole of 2016 that will demonstrate its more dominant position in the market after its take-over of BG Group of the UK. While giving its LNG sales volumes, the Anglo-Dutch giant has quickly done away with BG’s comprehensive roundup of its LNG portfolio activities, including cargo destinations and volumes by region. Shell gave its LNG sales volumes for the first-quarter of 2015 as 9.81MT and added

that its first-quarter 2016 liquefaction volumes at various plants amounted to 7.04MT. Shell’s overall first-quarter 2016 net income attributable to shareholders amounted to \$800 million compared with \$4.8 billion for the same quarter a year ago. “Compared with the first quarter 2015, earnings excluding identified items were impacted by the decline in oil, gas and LNG prices and weaker refining industry conditions,” Shell said. Shell Chief Executive Ben Van Beurden said the company’s Downstream and Integrated Gas businesses delivered strong results to underpin the financial performance despite continued low oil and gas prices. “We continue to reduce our spending levels, to capture cost opportunities and manage the financial framework in today’s lower oil price environment. The combination with BG is off to a strong start, as a result of detailed forward planning before the completion of the transaction. This will likely result in accelerated delivery of the synergies from the acquisition, and at a lower cost than we originally set out,” the CEO said. The company also admitted LNG setbacks during the first three months of 2016 that will have an impact on its strategy. During the quarter, first LNG production was achieved at the non-operated Gorgon project (Shell interest 25 percent) on Barrow Island, offshore Australia. “Subsequent to first LNG cargo delivery, LNG production was temporarily halted due to mechanical issues with the propane refrigerant compressor on Train 1,” the company explained.

TOKYO GAS, the third-largest Japanese buyer of liquefied natural gas, consolidated its natural gas sales last month and achieved initial success in May in signing up new power customers under Japan’s deregulation of its domestic energy markets. The Tokyo utility, known as Togas, last month launched sales of low-voltage electricity to residential and business customers in the Kanto region, including the Tokyo metropolitan area and seven adjoining prefectures. Togas is marketing power sales with its newly merged affiliate Chiba Gas Co., Tsukuba Gakuen Gas Co. and Miho Gas Co. as the four now compete in the liberalized power market. The largest city-gas utility has also signed a cooperation agreement with another of the nation’s utilities, Kansai Electric Power Co. Togas and Kansai have agreed a joint LNG procurement programme and “a technology alliance”

for power plant operations and maintenance. The imports of LNG by Togas itself are set to rise as it is a customer of the new Gorgon export plant in Western Australia and from 2017 will receive LNG shipments from the US. Their agreement follows a similar one arranged last year by competitors Tokyo Electric Power Co. and Chubu Electric, who formed a joint venture company called JERA Co. Inc. In its latest marketing figures Togas sold 1.32 billion cubic metres of natural gas in April, the equivalent of 976,800 tonnes of LNG, little changed from the same month a year ago, though down an actual 0.1 percent. It also said its marketing in the power market was showing initial success. Togas said the number of applications by customers to receive electricity as well as gas reached around 300,000, including 6,200 applications through its business partners for sales of the low-voltage power allowed for gas utilities in the residential and business sectors. Togas said that along with its three partners it was already supplying power to more than 210,000 customers. “Tokyo Gas is contributing to stable electricity supplies, lower electricity rates and greater freedom of choice for its customers,” it said. In its run-down of natural gas sales, Togas said there were increases in volumes sold to the industrial and wholesale sectors in Japan, though these rises were offset by lower volumes taken by the residential and business gas customers. Togas said the volume for wholesale gas supply to other city-gas companies totaled 184.8 million cubic metres, a rise of 3.1 percent compared with April 2015. The largest gas demand was in the industrial sector and rose 0.2 percent to 590.2M cubic metres compared with April 2015. In the residential sector, volumes totaled 350.9M cubic metres, down 1 percent year-on-year. The biggest fall within the business sector, comprising offices and shops, where sales were 197.4M cubic metres, down 2.2 percent from April 2015.

TRANSCANADA Corp., the Calgary-based builder of pipelines including to transport feed-gas for Canadian LNG projects, is re-filing its \$13 billion transaction to buy Columbia Pipeline Group Inc. with the US Federal Trade Commission under the review process. In buying US company Columbia, TransCanada is seeking to connect some of the most prolific natural gas supply basins in North America and give itself

access to the US shale gas transportation market. TransCanada is currently developing new pipelines in the Canadian province of British Columbia to enable the building of LNG export plants on the Pacific Coast to serve Asia. Among them is the Coastal GasLink, a 670-kilometres long natural gas pipeline from the Groundbirch area near Dawson Creek to proposed LNG projects around the coastal town of Kitimat. The TransCanada-Columbia Pipeline merger will create a 91,000-kilometre (57,000-mile) natural gas pipeline system across North America. The notification of the agreed takeover was first filed on April 4, 2016, with the US Federal Trade Commission. TransCanada said the refiling with the FTC would set a new 30-day period for review by the FTC. “Pull and refile” is a common procedure used by applicants to provide additional time to confirm aspects of complex transactions to the FTC. “TransCanada is cooperating with the FTC review and remains confident that it will receive clearance to allow the merger transaction to close in the second half of 2016,” the company said. The takeover requires approval by Columbia's shareholders and authorization by the Committee of Foreign Investment of the United States. “The acquisition represents an opportunity for TransCanada to invest in an extensive growing network of regulated natural gas pipeline and storage assets in the prolific Marcellus and Utica shale gas regions,” TransCanada said. In buying US company Columbia, TransCanada is seeking to connect some of the most prolific natural gas supply basins in North America and give itself access to the US shale gas transportation market. TransCanada is currently developing new pipelines in the Canadian province of British Columbia to enable the building of LNG export plants on the Pacific Coast to serve Asia. Among them is the Coastal GasLink, a 670-kilometres long natural gas pipeline from the Groundbirch area near Dawson Creek to proposed LNG projects around the coastal town of Kitimat. The TransCanada-Columbia Pipeline merger will create a 91,000-kilometre (57,000-mile) natural gas pipeline system across North America. The notification of the agreed takeover was first filed on April 4, 2016, with the US Federal Trade Commission. TransCanada said the refiling with the FTC would set a new 30-day period for review by the FTC. “Pull and refile” is a

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US DEPARTMENT of Energy's has published data on liquefied natural gas exports for the first quarter of 2016, showing prices of LNG sold from the Cheniere Energy plant at Sabine Pass in Louisiana ranging from \$3.35 per million British thermal units to \$3.77 per MMBtu. Four commissioning cargoes from Sabine were shipped from the Cameron Parish facility to customers in Brazil, India and the United Arab Emirates. The 160,000 cubic metres capacity “Asia Vision” and the 165,000 cubic metres capacity “GasLog Salem” shipped their cargoes to Brazil at the respective prices of \$3.35 per MMBtu and \$3.62 per MMBtu, according to the US data. The 155,900 cubic metres capacity carrier “Clean Ocean” delivered to India at a price of \$3.77 per MMBtu. A fourth cargo was from the 159,924 cubic metres capacity “Energy Atlantic” and was unloaded at the Dubai import terminal in the United Arab Emirates at a price charged in Louisiana of \$3.39 per MMBtu. The spot-purchased cargoes were sold at export point prices, also known as free on board (FOB) prices, whereby the buyers supplied the ships and the LNG was loaded on board. The report also indicates that American LNG Marketing exported some domestically-produced LNG via ISO containers from Miami, Florida, to Barbados at FOB prices ranging from \$10.00 per MMBtu to \$15.78 per MMBtu. Three cargoes were also imported into the US in the first quarter from Trinidad in the Caribbean to the Everett import facility, near Boston, Massachusetts. The Everett terminal is owned by Distrigas, an affiliate of France's Engie, and it has a series of contracts to supply the equivalent of three LNG carrier shipments to New

England gas utilities for winter peak demand through 2016. Volumes sold by Distrigas and supplies offered are based on US natural gas prices. For its short-term and long-term contracts, the LNG is trucked from the Everett terminal, to the utilities' LNG storage facilities across New England.

VENTURE GLOBAL LNG, a Washington DC-based company, said it raised additional equity investments for the two liquefaction and LNG export plants it is developing in Louisiana, one at Plaquemines on the banks of the Mississippi River and a second near the Calcasieu Ship Channel. The VG Plaquemines project will be located on 630 acres near river mile-marker 55 on the west side of the Mississippi, 30 miles south of New Orleans. The Mississippi river project will produce 20 million tonnes per annum of LNG and will include 20 small-scale liquefaction Trains, four LNG storage tanks and three marine loading berths for ocean-going vessels. VG is also planning to produce 10 MTPA of LNG at its Calcasieu Pass facility to be developed on a 1,000-acre site located at the intersection of the Calcasieu Ship Channel and the Gulf of Mexico. The VG development company was founded by a banker and a lawyer. The two are Michael Sabel, an equity fund manager and venture capitalist, and Robert Pender, a former partner at Hogan Lovells, a global law firm. Both are now joint chief executives and co-chairmen of the VG LNG company. VG said it raised additional capital of \$55 million, bringing the total funding to date to more than \$265M. The proceeds will fund VG LNG development activities for both of its proposed export facilities. In a joint statement, Co-CEOs Mike Sabel and Bob Pender stated: “This latest equity raise is further affirmation that the market and investors recognize and value our company's continued execution on significant project milestones, as well as our competitive advantage as the low-cost provider of North American LNG.” In February 2016, VG signed a sales and purchase agreement with Shell North America for 1 MTPA of LNG from the Calcasieu Pass plant. The accord with Shell is for 20 years with the cargoes being supplied on a free-on-board basis (FOB), whereby the Anglo-Dutch company supplies the ships, for a purchase price indexed to the monthly Henry Hub price plus a facility fee indexed to inflation.

WOODSIDE, Australia's largest liquefied natural gas operator, has increased the volume and potential of its two recent natural gas discoveries offshore Myanmar. The Woodside discoveries were announced in January and February 2016 in blocks about 100 kilometres offshore Myanmar in the Rakhine Basin of the Bay of Bengal. Woodside is a leading Asia-Pacific LNG producer from the two liquefaction plants it operates in Western Australia, the Northwest Shelf facility and Pluto LNG. It also has a stake in the Australian onshore Wheatstone LNG plant currently being constructed and the Browse FLNG venture under postponement. The Australian company increased to 32 metres of net gas pay from 15 metres of net pay its exploration estimate in the Block A-6 Shwe Yee Htun-1 well. Woodside said the Shwe Yee Htun field resource estimate is 895 billion cubic feet of dry recoverable gas. It also increased the Block AD-7 Thalín-1A exploration well estimate to 62m of net gas pay. The Thalín field contingent resource is 1,510 Bcf of dry recoverable gas. Woodside holds 40 percent of each block with the balance held by the government of Myanmar. Woodside Chief Executive Peter Coleman said analysis of the exploratory well data confirmed the development potential of both discoveries, with further appraisal and exploration of four to seven wells planned to start in the first quarter of 2017. “The logical development option for the Thalín-1A discovery is a tieback to the nearby Shwe Field,” Coleman said. “Our strategy is to fully appraise the discovery in one campaign, thereby facilitating concept select in 2017,” it added. Woodside said the Shwe Yee Htun-1 discovery has both tieback and standalone development options. “We recognize additional exploration potential in areas immediately adjacent to the discovery and will target these to ensure any development concept is commensurate with the full block potential,” Coleman explained. Woodside reported an increase in its best estimate contingent resource by 83 million barrels of oil equivalent to 4,481 MMboe following the announcement of its two gas discoveries offshore Myanmar. “The company's early success in Myanmar establishes the petroleum system credentials of the Rakhine Basin, where Woodside is one of the largest acreage holders, with interests in six blocks,” Woodside said. ■

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Nigeria LNG increases security with patrol boats amid struggles with various problems

West African nation's energy industry is hampered by myriad of issues, including piracy, sabotage and lack of investment

Four new security patrol vessels will now help protect the Nigerian LNG export plant on Bonny Island in the Niger delta as security is stepped up in West African waters, which according to the US government have now replaced Somalia as the danger area for acts of piracy and attacks on shipping.

“The patrol boats will be used to provide security patrol and escort services for LNG tankers calling in and out of the Nigerian LNG Bonny terminal,” said Dutch shipbuilder Damen Group, the supplier of the vessels under licence.

Protected

Damen said the 16-metres craft are made with aluminium hulls and fibre-reinforced polymer.

The accommodation has been additionally clad with bullet-proof materials to protect the personnel inside.

Before delivery to Nigeria, the patrol boats were fitted out at the Damen shipyard at Gorinchem in the Netherlands.

All four vessels also feature upgraded water jets and engines. Nigeria LNG has chartered the patrol boats for up to five years.

That’s as a new report from the US government says piracy offshore West Africa has increased over the past few years, affecting the region’s LNG and oil and gas industry.

Security experts say that the West African coast has become the most dangerous in the world as the amount of piracy incidents has surpassed those in East Africa, around the area of offshore Somalia.

Concerns

The International Maritime Bureau, an agency that tracks piracy incidents, believes that piracy occurrences are also under-reported in West African waters because of concerns of even more attacks.

In addition to the growing piracy, Nigeria has experienced increased pipeline vandalism, kidnappings and militant takeovers of oil facilities in the Niger Delta.

In the past, the Movement for the Emancipation of the Niger Delta (MEND) was one of the main groups attacking or threatening attacks on oil infrastructure

for political objectives, claiming to seek a redistribution of oil wealth and greater local control of the oil sector.

Security concerns have led some energy services firms to pull out of the country.

The new security vessels chartered for Nigeria LNG are owned by C&I Leasing Plc, a player in the Nigerian offshore support vessel market.

Nigeria is the largest natural gas and LNG producer in West Africa, although there also have been recent production increases in Equatorial Guinea and a new floating LNG venture is planned.

Angola was expected to add to West Africa's production in the near term with the start-up of its first LNG liquefaction facility in 2013.

However, in April 2014, Angola LNG temporarily shut down the plant because of ongoing technical issues, which led to infrequent exports while it was open.

Regional occurrences

Technical issues at the plant included electrical fires, pipeline leaks and ruptures, and a collapsed drilling rig.

Recommissioning of the Angola LNG plant began in January 2016 and operator Chevron was scheduled to ship the first cargo from the revived facility before the third quarter of 2016.

The US Energy information Administration recently updated its review of Nigeria’s LNG and oil and gas industry.

“In Nigeria, security concerns and uncertainty over terms of access have delayed proposed export projects and limited mid-term production growth,” the EIA said.

“There are no new LNG export projects on the immediate horizon amid continued gas-flaring, sabotage attacks, offshore piracy and a lack of regulation to encourage more foreign investment,” it added.

Nigeria exported 19.5 million tonnes of LNG in 2015, little changed from the previous year at 19.1MT, behind Qatar (78.4MT), Australia (29.4MT) and Malaysia (24.9MT), with Indonesia occupying fifth place with 18.1MT.

Nigeria's LNG exports accounted for about 8 percent of LNG traded globally.



LNG tankers calling in or out of Bonny Island terminal to be escorted

Japan is the largest importer of Nigerian LNG with more than 25 percent, followed by Spain, India and South Korea.

“Trade patterns for Nigerian LNG have changed over the past few years,” the EIA said.

“Most notably, Nigeria's LNG exports to Europe have decreased significantly. In 2010, Europe imported about 67 percent of total Nigerian LNG exports, but that share dropped to 23 percent in 2014.

“Nigeria has increased its LNG exports to Asia, namely Japan, following the Fukushima nuclear incident in March 2011. Japan's imports of Nigerian LNG were almost eight times the 2010 level in 2014,” the report noted.

The US itself no longer imports LNG from Nigeria following a peak year in 2016 before the North American shale-gas boom.

Projects

Nigeria's LNG facility on Bonny Island in the Niger Delta is the country's only operating plant and while other projects have been proposed, none has moved forward.

The shareholders in Nigeria LNG are Nigeria National Petroleum Corp. (49 percent), Royal Dutch Shell (25.6 percent), France's Total (15 percent) and Italy's Eni (10.4 percent).

NLNG currently has six liquefaction trains with a production capacity of 22 MTPA and a seventh Train has been planned for some time.

Brass LNG, a consortium made up of NNPC, Total, and Eni, has been under development for several years. ConocoPhillips was a partner in the consortium but pulled out of the project in

mid-2014. The US report noted that Nigeria was the largest holder of proved natural gas reserves in Africa and the ninth-largest holder in the world.

Gas-related

“However, production is constrained by the lack of infrastructure to monetize natural gas that is currently being flared,” the EIA said.

“The natural gas industry is also affected by the same security and regulatory issues that affect the oil industry,” it said.

“Pipeline sabotage and supply disruptions are common in Nigeria's natural gas industry,” the EIA added.

A significant amount of Nigeria's gross natural gas production is flared because some of Nigeria's oil fields lack the infrastructure needed to capture the natural gas produced with oil, known as associated gas.

In 2014, Nigeria flared 379 billion cubic feet of its associated gas production, or 12 percent of its gross output.

“Nigeria now ranks as the fifth-largest natural gas flaring country, down from the second position it held in 2011,” the EIA said recently.

Shell view

“According to Shell, one of the largest gas producers in the country, the impediments to decreasing gas flaring have been the security situation in the Niger delta and the lack of partner funding that has slowed progress on projects to capture associated gas,” the report said.

While Nigeria is the largest oil producer in Africa its supplies are

affected by continued and worsening acts of sabotage.

"Pipeline sabotage and oil supply disruptions have increased in 2016, leading to a decline in Nigeria's crude oil production.

"Because Nigeria heavily depends on oil revenue, its economy is noticeably affected by changes to its oil production and/or to global crude oil prices.

"The IMF projects that Nigeria's oil and natural gas exports earned \$52 billion in 2015, \$35Bln less than in 2014, which is mostly attributed to the fall in oil prices that began in mid-2014," the EIA stated.

Pipeline

While the vast majority of Nigeria's natural gas exports are in the form of LNG, a small amount is exported via the West African Gas Pipeline to nearby countries.

The 420-mile pipeline carries natural gas from Nigeria's Escravos region to Togo, Benin, and Ghana, where it is mostly used for power generation.

However, the pipeline was recently shut down for about a year for repairs after a ship's anchor severed the pipeline in Togolese waters. Natural gas exports via the pipeline were last at 21 Bcf.

Another US concern has been the Petroleum Industry Bill (PIB), which was initially proposed in 2008, and was expected to change the organizational structure and fiscal terms governing the oil and natural gas industry if it becomes law.

Regulatory uncertainty has resulted in fewer investments in new oil and natural gas projects, and no licensing round has occurred since 2007.

The amount of money that Nigeria loses every

year from not passing the PIB is estimated to be as high as \$15Bln.

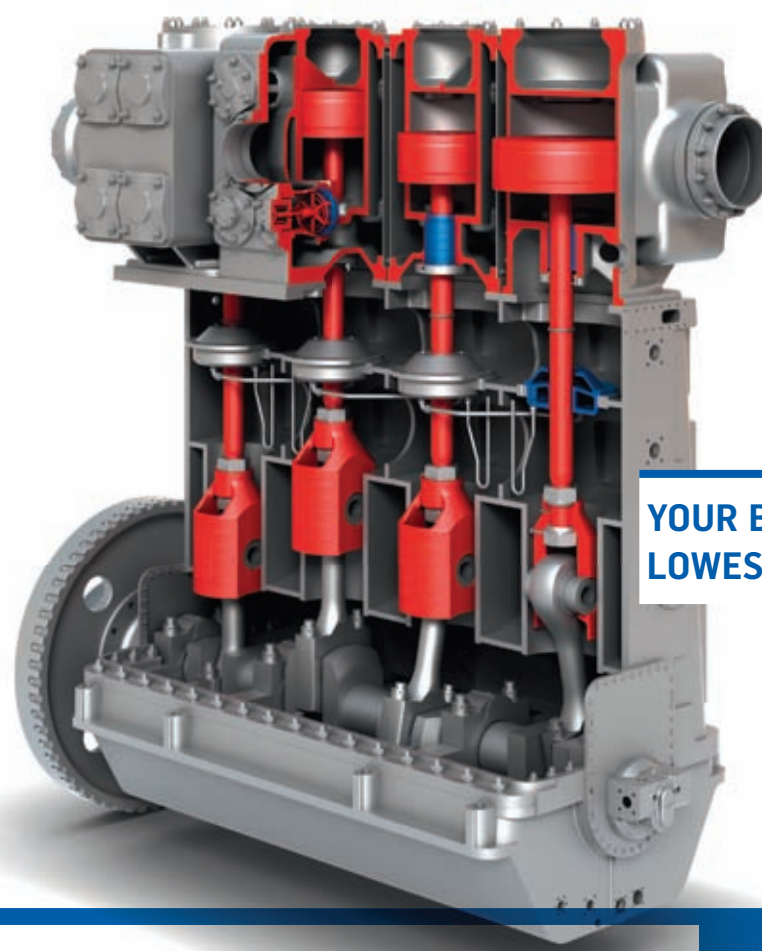
In December 2015, a new draft of the PIB was introduced, proposing that

Nigeria's NNPC be split into a national oil company and a Nigeria Petroleum Assets Management Company.

The draft also proposed the creation

of a Special Investigations Unit to curtail corruption.

Despite the delays, efforts to reform NNPC are said to be underway. ■



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LNG industry may need fresh approach to redrawing the market and price grids

Salman Ghouri, Oil and Gas industry advisor Qatar; Mian Aneesuddin, Oil and Gas Advisor Qatar and Yumna Ghouri, analyst, Dallas, USA

The liquefied natural gas industry has historically failed accurately to predict demand and in the process has constructed significantly more of the fuel that could expected to be absorbed by the market given the state of the global economy.

We will look at what strategy LNG producers may adopt to balance the existing glut and future LNG processing Trains currently planned or under construction.

Evolution

The formulation of strategy is a dynamic concept. However, one that is drawn up in the year 2000 may not work if applied in 2016 – or even just a year later - as key parameters such as the prevailing economic environment and supply-demand dynamics may have changed.

In the past the global LNG industry has gone through various phases in terms of technological advancements having an impact and affecting the overall market.

For example, liquefaction Train capacities were barely 0.37 million tonnes per annum (MTPA) during 1960s.

Later, with the technological innovation production capabilities and economies of scale gradually increased through 1 MTPA 1.5 MTPA and 2.5 MTPA and onwards before reaching 7.8 MTPA with the super-Trains built in Qatar.

Now an 8.4 MTPA processing Train is under planning by Royal Dutch Shell and its partners in the Nigerian Train 7 project.

The Train capacities in the range of 1.0 MTPA to 5.5 MTPA are still common, however, and are still favoured, depending on the available of gas resources and a growing market for small-scale and mid-scale liquefaction plants.

Carriers

On the transportation front, LNG carriers are also getting bigger with the passage of time, ranging from 18,000 cubic metres capacity to 266,000 cubic metres over five decades of LNG history and shipbuilding.

However, the LNG carrier standard size was previously below 150,000 cubic

metres capacity before the Qatar Q-Flex and Q-Max carriers made the 210,000 to 266,000 cubic metres capacity to new economy of scale.

Larger cargoes could be delivered worldwide and a more recent trend has been splitting cargoes at some Far East and other destinations.

The industry has also witnessed frequent flip-flops in the market, variously favouring the seller then the buyer and the seller again before changing again.

The long-term contracts were linked to crude oil prices with annual contracted quantity (ACQs) with destination restrictions and other conditions.

Growth economies

Since the early 2000s, the demand for LNG increased rapidly in Europe and two emerging economies, China and India, emerged as buyers in addition to the traditional Asian purchasers, Japan and South Korea.

The supply side also expanded as new LNG hit the market. The biggest upset to the traditional LNG market was observed during the late 1990s and during 2000s when Qatar aggressively developed its North Field and within a short period of over a decade became the world's largest LNG producer and exporter.

Later, Australia also decided to expand its LNG supplies aggressively. The entry of both Qatar and Australia as major suppliers has changed the dynamics of the industry, which was at one time dominated by Indonesia, Malaysia, and Algeria.

Qatar edge out the other pioneer LNG producers due to its market proximity, large gas reserves and its construction of the world's largest LNG Trains and ships to maximize economies of scale.

During this “flip flop” process buyers also started taking advantage of the availability of diverse sources.

As the bulk of new LNG supplies that became available came from Qatar and Australia, both China and India emerged as new buyers.

They were able to take advantage of the buyer's market in securing attractive LNG prices for the first five years.



Game changer: 'Asia Vision' lifted the first US Sabine Pass export cargo

The abundant supplies from alternative sources also allowed the new buyers to change the SPA terms in their favour - introducing “S” curve protection and removing destination clauses etc.

It has to be said that the industry quickly adjusted to the new environment and was quite accommodating to meeting the new challenges and headwinds.

Dilemma

The rationale of the ACQ in LNG sale purchase agreements (SPAs) is to protect the seller's huge upfront capital investments.

Companies must secure buyers for this minimum quantity before a final investment decision is made to proceed with a liquefaction project.

In the past, this mechanism was working quite well and there were no issues. However, during 2014 and into 2015 and now 2016, as collapsing oil prices have set in, weaker LNG demand and more LNG supplies created a situation where spot prices fell well below contracted prices.

The reason for this is reason that the oil prices went below the minimum threshold level of the “S” curve whereby LNG values are insensitive to oil crude prices.

As a result, spot prices fell below the long-term contracted formula based prices. In an environment of weaker domestic demand and lower spot prices, buyers were reluctant to lift ACQ. Rather

they preferred to take advantage of buying spot cargoes.

That was different from the period of higher oil prices and higher demand when buyers were interested in lifting more than they had signed up for under the ACQs.

As oil prices increase more than the “S” curve protection of the upper limit it was beneficial for the sellers to sell uncontracted quantities in the spot market (at a time when spot prices were higher than contracted prices – at one time being at around \$21 per million British thermal units (MMBtu) for a delivery to Japan).

However, for buyers this is certainly not a pleasing situation. In other words, issues of ACQ emerge whenever oil prices exceeded/reduced above/below the agreed price band (or some unusual demand/supply increase or disruption).

From the seller's perspective, they like to protect their investment and ensure a desired rate of return by selling the required ACQs.

Challenges

The challenges for the global industry are enormous, especially for the LNG sellers. The weaker global economic growth, particularly the slowing down in China, as well as the economic struggles in Europe, Brazil, Russia and Japan will have their effects.

In addition, with Japan being in the process of re-starting a number of nuclear plants its future price of LNG is likely to

be further depressed. There current oversupply will be added to as more new supplies hit the market from 2016-2020.

During 2016, a total of 26 plus MTPA will be added to global supplies - with Australia's additional 20 MTPA, Indonesia's extra 2 MTPA, Malaysia 4.8 MTPA and some US LNG from the Sabine Pass plant in Louisiana.

For the supply market after that, everyone has gone back to the drawing board as many projects that were planned to come on stream are not now going ahead - or if they are, they are running later.

In 2017, a further 23.4 MTPA was scheduled to be added, followed by 100.57 in 2018 and 121.5 MTPA in 2019.

It is likely that the new totals through 2020 will not even come near to reaching 127 MTPA during the lead-up.

The edge

As more LNG will be available than there is demand for, the buyers will have an edge over the sellers over the next three to four years.

They will also avail themselves of the opportunity to renegotiate existing terms of agreements - including demanding the changing of weights, oil price band and

will also look for flexible ACQs (maybe linking with an increase/decrease in oil prices).

Buyers should not be too adamant as the industry is dynamic and the current situation will change quickly to the advantage of the sellers - this is a key lesson from history.

In all fairness, buyers should understand that the huge capital upfront investment of billions of dollars (Australian Gorgon cost US\$54 billion) by the sellers and exposure to risk they have carrier, the export plant owners have every right to maximize their returns on capital expended.

Both the buyers and sellers should work in amicable manner and try to formulate any new terms, taking into consideration extreme eventualities and the need for the protection of the rights of both the buyer and the seller.

No doubt, more LNG supplies will accelerate the development of spot markets by allowing both the buyers and sellers to devise a mechanism of a flexible ACQ, providing some room for flexibility to take advantage of market conditions.

More LNG supplies will also facilitate a rationalization of prices - reducing the large differential across continents.

Given the huge LNG supplies coming on stream during 2016-2020 and even thereafter, it appears to be a difficult period for LNG sellers.

That said, with appropriate investment and a proper marketing strategy these challenges may be converted into opportunities.

In order to take advantage, understanding the future market dynamics is the most critical factor in devising that strategy.

Approach

First of all, sellers have to develop a new approach to retain their existing buyers and then look for new customers.

They have to be proactive in securing their current buyers by taking the lead in finding out and addressing the concerns of their clients and providing some flexibility in adjusting ACQs (linking with the oil prices or some other flexible mechanism).

Sellers must also acquaint themselves with smaller countries that have the potential demand and which may need the underwriting of Floating Storage and Regasification Units as import terminals. Another area of growth is the use of LNG as fuel to the shipping industry.

In addition to long-term contracts, the reduced and short-term contract will become more common.

Future

In fact, the future LNG market would be like a distribution company, supplying LNG wherever it is required.

To meet the demand of smaller consumers, the industry may have to make investments in smaller LNG carriers, bunkering vessels, floating storage facilities, FSRUs as well as considering investment in power generation in target countries to secure LNG sales (they may also target countries where the bulk of oil is being used in power generation like Saudi Arabia).

It may look like an irrational idea now but the way the market is expected to develop, the spot price and shorter-term sales contract took become the norm.

The companies who foresee the future correctly and accordingly adjust their strategies will be clear winner in capturing market share.

One thing is certain, future LNG projects will be undertaken to meet the ever increasing demand for the environmental fuel of choice for the power and transport sectors. ■

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The 2016 issue of *LNG Shipping Review* will contain our usual look at the industry's leading players – owners, managers and operators.

This is an ever changing listing, as more players enter the market and vessels are delivered, change hands, or are deleted by way of recycling.

We will also include a profile of a leading player in the market highlighting the company's LNG involvement, how it got to the position it finds itself in today and its future plans.

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Extra distribution: SMM | Hamburg | 6-9 September 2016

Swedish company rethinks the operational ‘transfer interface’ for LNG fuel handling

Marco Urbino, Regional Manager for Swedish Trelleborg's fluid-handling operations

As uses of liquefied natural gas diversify, both in terms of profile and region, safety must always remain paramount. Other factors - including costs and speed of delivery – also remain critical elements when project planning.

And, perhaps fortuitously, it is the area where safety is most key that may also offer the best opportunity for significant project cost and time savings - the “transfer zone” - where the LNG carrier is loading or unloading.

Small-scale LNG transfer, whether ship-to-shore or offshore ship-to-ship, remains in its relative infancy in terms of the development of infrastructure to meet increasing supply and demand.

Yet, as the market has developed over the past decade, so too has new thinking around innovative means to transfer LNG; finding solutions that strike the balance between new means to improve operability while maintaining the highest safety standards.

To date, small-scale LNG transfer has been utilized to reflect emerging demand threads: ship-to-shore (for regasification, liquefaction and terminal loading and unloading, and gas power generation loading and unloading), and offshore ship-to-ship (one carrier to another and ship to floating storage and regasification units)

Ship-to-Shore

The ship-to-shore market, in particular, is spawning new innovation in loading and unloading LNG transfer.

Growing interest in the natural gas option from energy customers remote from the grid and with limited volume requirements is spurring interest in small-scale LNG, notably in the form of coastal gas carriers and regional distribution terminals.

Energy analysts continue to predict rapid growth in volumes of LNG, with many receiving terminals required and many more are planned, for example in the US, Europe, South-East Asia and China.

As an example of the potential for small scale LNG ship-to-shore transfer, one need only look at Indonesia.

With ambitions to reach an electrification ratio of 100 percent by

2019, the country has scheduled to build 32 power plants, providing a total of 35,000 megawatts (MW) of additional power to reach its goal.

Supporting infrastructure will include small-scale LNG projects, both floating regasification units (FRUs) and floating storage units (FSUs), to provide gas to these facilities.

Indonesia is a polarization of the exponential growth over the past decade in FSRU, but also for the development of LNG loading and unloading facilities for power generation.

Opportunities

The opportunities for small-scale LNG shipping allows gas power generation in remote locations and often inaccessible locations.

The scale of Indonesia's power-generation plans is positioning the country to become one of the fastest-growing markets for LNG and a regional first-mover in small-scale LNG in Asia.

“Indonesia has the potential and the ambition to become Asia's most important small-scale LNG player,” brokerage advisor Poten & Partners was quoted as saying in April 2016.

“LNG particularly appeals to the archipelago because a number of stranded markets have no electricity and it would be impractical and expensive to build pipelines from remote gas fields to power plants serving such limited demand,” it added.

Once the country has established additional import hubs, the challenge will be to get the gas to the islands and communities that most need it. Like many small-scale LNG projects, speed is of the essence.

Ambitious plan

Indonesia's ambitious plans must be set within the context of project costs and speed of project delivery.

When comparing the cost of investment in an LNG ship-to-shore project to that of a “traditional” oil field development, the most striking difference is the capital required. A “traditional” LNG project is nearly 10 times more expensive.



Ship-to-shore configuration for transferring cargoes of LNG

Traditional thinking in loading and unloading infrastructure to support such projects has been to build a capital-intensive permanent jetty structure complete with breasting and mooring dolphins, fenders and loading arms to load and unload LNG.

Designs

This would be either for regasification or liquefaction terminals or loading and unloading for gas power generation.

However, as well as being costly, this is at odds with the importance of reliable and quick installation and improved operability that are often key elements in any new project.

The alternative now challenging that thinking is Cryoline hose-in-hose transfer solutions.

Designed for fatigue resistance in even the most hazardous conditions and requiring only a concrete platform onshore to “host” the hose storage facilities, construction time compared to building a jetty infrastructure is reduced down to a matter of weeks from up to a year for jetty construction.

The innovation and flexibility provided by cryogenic hose-in-hose technology replaces the need for fixed onshore infrastructure altogether - potentially enabling project Capex savings of more than \$100 million.

This reduced capital expenditure and installation lead time offers huge advantages to gas power generation

projects in more remote areas (often improving the wholesale gas price required by the power plant) as well as to new terminal, regasification and liquefaction projects.

In addition to Capex savings, hose-in-hose solutions such as Trelleborg's - the first to receive EN1474-2 accreditation for its 20-inch Cryoline LNG hose - can be extended to up to 800 metres away from shore.

They are also operable in all sea states and typically utilize only 12-inch to 16-inch hoses enabling to cope with LNG flow rate up to 10,000 cubic metres per hour.

Moreover, as Cryoline hose solutions are designed for 500 loading or offloading operations, they can be effectively operated for 10 years and will not incur significant decommissioning costs - currently millions of dollars for LNG jetties.

Ship-to-Ship

As regulations around reducing the impact of the LNG infrastructure's environmental impact become better understood, jetties will on average have to be decommissioned after 20-25 years of use.

This adds millions of dollars to the life-cycle cost of using a jetty for ship-to-shore transfer.

The development of new power plants requiring innovative thinking around loading and unloading (in addition to



Ship-to-ship set-up for safe offshore handling of the fuel

continued demand for ship-to-shore infrastructure for terminal, regasification and liquefaction), has coincided with the development of floating receiving and distribution terminals.

Floating receiving and distribution terminals and coastal gas carriers are now an integral part of LNG activities and a crucial cog in the LNG supply chain.

Loading and unloading of LNG in the offshore environment presents fresh challenges for the oil and gas industry.

While it offers more flexibility for storage and transfer out with increasingly congested ports and minimizes voyage time, the highest levels of safety need to be maintained amid the effects of winds, waves and currents in the open seas.

Where conditions are much more demanding, conventional marine loading

arms do not suffice, as they can result in a shutdown of transfer operations.

However, tandem loading and offloading allows vessels to keep more distance between, enabling them to mitigate the risk of collision between the two vessels and enhancing safety.

Trelleborg's research and development facilities for hoses in Clermont-Ferrand, France, developed Cryoline handling solutions for two important growth areas in LNG offshore handling: Ship-to-ship floating configuration and ship-to-ship aerial configuration.

Floating configuration

As gas extraction diversifies into frontier regions, Trelleborg's Cryoline technology handling solutions offer a new, safe and robust means of safely loading and unloading in all conditions. Moreover, the heavy duty hose design reduces risk of

damage to the hose during handling, having been designed for fatigue resistance in even the most hazardous conditions.

Cryoline hose-in-hose technology offers a more viable and innovative alternative to existing ship-to-ship transfer systems, ensuring higher safety and operability standards as the distance between the vessels can be increased in both ship-to-ship and tandem transfer

With Trelleborg's floating cryogenic hoses, vessels can be moored as much as 300 to 500 metres away from a storage unit, allowing for ship-to-ship transfer in deeper waters in even the most challenging conditions.

For ship-to-ship floating configuration, Cryoline hoses are available with large inner diameters ranging from 16 to 20 inches.

Aerial

This will provide operators with a greater choice of configuration, more flexibility, and a less strenuous replacement to conventional ship-to-ship systems.

For example, in ship-to-ship aerial transfer, only three of Trelleborg's 16-inch Cryoline hoses can be used instead of 10 eight-inch hoses - reducing handling time by as much as 60 percent.

During the development of the Cryoline hose-in-hose technology, several full-scale hose prototypes were successfully tested in both static and dynamic conditions - with most tests taking place in cryogenic conditions at -

196 °C/ -321 °F - demonstrating their ability to withstand fatigue resistance in even the most hazardous conditions.

With no use of "Y-piece" joints required, Cryoline technology ensures less handling, fewer potential leak points and less likelihood of pressure outage, while the loading and offloading lead times are greatly reduced.

In addition, Cryoline technology handling solutions utilise only three 16-inch hoses instead of 10 eight-inch hoses; reducing lifting and handling procedure time by as much as 30 percent and saving operational expenditure.

Boil-off generation during transfer presents another challenge for operators in offshore conditions, often causing valuable energy loss during the transfer process.

Therefore, the Trelleborg team focused on developing game-changing technology with insulated hoses that can reduce boil-off by as much as 60 percent.

This equates to a saving of 10 billion thermal units of energy saved over the course of 500 transfers while all Cryoline technology handling solutions come with built-in leak monitoring systems as standard.

As a clean, competitively priced, energy source, demand for LNG will only grow in new regions and locations. As these markets develop, so the frequency of multi-faceted loading and unloading transfers will too. To keep pace, managing the intensity of life in the "transfer zone" needs new, flexible and innovative re-thinking. ■

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World LNG Carrier Fleet

LNG carrier	Capacity m³	Owned or Ordered by	Builder	Delivery Date	Flag	Power Plant	Cargo System	No. of tanks	Ship built for Export plant
Aamira	266,000	QGTC	Samsung	Dec-10	Liberia	DRL	TZ Mk. III	5	Qatargas IV
Abadi	135,000	Brunei Gas Carriers	Mitsubishi Nagasaki	Jun-02	Brunei	S	Moss	5	Brunei LNG
Abdelkader	177,000	MOL-Itochu	Hyundai	Feb-09	Panama	DFDE	TZ Mk. III	4	Various
Adam LNG	162,000	Oman LNG	Hyundai	Dec-14	Marshall Is.	DFDE	TZ Mk. III	4	Oman LNG
Al Aamriya	210,100	J5 Consortium	Daewoo	Feb-08	Marshall Is.	DRL	GT NO 96	4	Qatargas
Al Areesh	151,700	Teekay LNG	Daewoo	Jan-07	Qatar	S	GT NO 96	4	Ras Gas II
Al Bahiya	266,000	QGTC	Samsung	Oct-09	Liberia	DRL	TZ Mk. III	5	Qatar-Atlantic
Al Biddah	135,275	J4 Consortium	Kawasaki Sakaide	Nov-99	Japan	S	Moss	5	Qatargas
Al Daayen	151,700	Teekay LNG	Daewoo	Apr-07	Qatar	S	GT NO 96	4	RasGas II
Al Dafna	266,000	QGTC	Samsung	Oct-09	Marshall Is.	LR DRL	GT NO 96	4	Qatar-Atlantic
Al Deebel	145,000	Peninsular LNG	Samsung	Dec-05	Bahamas	S	TZ Mk. III	4	Qatargas
Al Gattara	216,200	OSG/Nakilat	Hyundai	Oct-07	Marshall Is.	DRL	TZ Mk. III	4	Qatargas II
Al Ghariya	210,100	ProNav	Daewoo	Feb-08	Bahamas	DRL	GT No. 96	4	Qatargas
Al Gharaffa	216,200	OSG/Nakilat	Hyundai	Jan-08	Marshall Is.	DRL	TZ Mk. III	4	Various
Al Ghashamiya	216,000	QGTC	Samsung	Mar-09	Liberia	DRL	TZ Mk. III	4	Qatar-Atlantic Basin
Al Ghuwairiya	261,700	QGTC	Daewoo	Aug-08	Marshall Is.	DRL	GT NO. 96	5	Qatar-Atl’c Basin
Al Hamla	216,000	OSG	Samsung	Feb-08	Marshall Is.	DRL	TZ Mk. III	4	QatarGas
Al Hamra	137,000	National Gas Shipping	Kvaerner-Masa	Jan-97	Liberia	S	Moss	4	ADGAS
Al Huwaila	217,000	Teekay	Samsung	May-08	Bahamas	DRL	TZ Mk. III	4	RasGas III
Al Jasra	137,100	J4 Consortium	Mitsubishi Nagasaki	Jul-00	Japan	S	Moss	5	Qatargas
Al Jassasiya	145,700	Maran-Nakilat	Daewoo	May-07	Greece	S	GT No 96	4	RasGas
Al Kharaitiyat	216,200	QGTC	Hyundai	May-09	Liberia	DRL	TZ Mk. III	4	Qatargas III
Al Kharaana	210,000	QGTC	Daewoo	Oct-09	Marshall Is.	DRL	GT NO 96	4	Qatargas IV
Al Kharsaah	217,000	Teekay	Samsung	May-08	Bahamas	DRL	TZ Mk. III	4	RasGas III
Al Khattiya	210,000	QGTC	DSME	Oct-09	Marshall Is.	DRL	GT No. 96	4	Qatargas IV
Al Khaznah	135,500	National Gas Shipping	Mitsui Chiba	Jun-94	Liberia	S	Moss	5	ADGAS
Al Khor	137,350	J4 Consortium	Mitsubishi Nagasaki	Dec-96	Japan	S	Moss	5	Qatargas
Al Khuwair	217,000	Teekay LNG	Samsung	Jul-08	Korea	DRL	TZ Mk. III	4	RasGas
Al Mafyar	266,000	OSG/Nakilat	Hyundai	Oct-07	Marshall Is.	DRL	TZ Mk. III	4	Qatargas II
Al Marrouna	151,700	Teekay	Daewoo	Nov-07	Bahamas	S	GT NO 96		Ras Gas I
Al Mayeda	266,000	QGTC	Samsung	Jan-09	Liberia	DRL	TZ Mk. III	5	Qatar-US/Var.
Al Nuaman	210,000	QGTC	DSME	Dec-09	Marshall Is.	DRL	GT No. 96	4	Qatargas IV
Al Oraiq	210,000	J5 Consortium	Daewoo	Apr-08	Marshall Is.	DRL	GT No. 96	4	Various
Al Rayyan	135,360	J4 Consortium	Kawasaki Sakaide	Mar-97	Japan	S	Moss	5	Qatargas
Al Rekayyat	216,200	QGTC	Hyundai	Jun-09	Bahamas	DRL	TZ Mk.III	4	Qatar-Atlantic
Al Ruwais	210,100	ProNav	Daewoo	Nov-07	Germany	DRL	GT NO 96	4	Qatargas II
Al Sadd	210,100	QGTC	Daewoo	Mar-09	Liberia	DRL	GT NO 96	4	Qatar-Atlantic Basin
Al Safliya	210,100	ProNav	Daewoo	Dec-07	Bahamas	DRL	GT NO 96	4	Qatargas II
Al Sahla	216,200	J5	Hyundai	Jun-08	Japan	DRL	TZ Mk. III	4	Ras Gas III
Al Samriya	261,700	QGTC	Daewoo	Sep-08	Marshall Is.	DRL	GT NO. 96	5	Qatargas II
Al Sheehaniya	210,100	QGTC	Daewoo	Feb-09	Liberia	DRL	GT NO 96	4	Qatar-Atlantic Basin
Al Shamal	217,000	Teekay LNG	Samsung	Jun-08	Qatar	DRL	TZ Mk. III	4	RasGas
Al Thakhira	145,000	Peninsular LNG	Samsung	Sep-05	Bahamas	S	TZ Mk. III	4	Qatargas
Al Thumama	216,000	J5 Consortium	Hyundai	Apr-08	Japan	DRL	TZ Mk. III	4	Rasgas
Al Utouriya	215,000	J5	Hyundai	Sep-08	Panama	DRL	TZ Mk. III	4	RasGas
Al Utourma	215,000	J5	Hyundai	Sep-08	Panama	DRL	TZ Mk. III	4	Ras Gas III
Al Wajbah	137,350	J4 Consortium	Mitsubishi Nagasaki	Jun-97	Japan	S	Moss	5	Qatargas
Al Wakrah	135,360	J4 Consortium	Kawasaki Sakaide	Dec-98	Japan	S	Moss	5	Qatargas
Al Zhubarah	137,570	J4 Consortium	Mitsui Chiba	Dec-96	Japan	S	Moss	5	Qatargas
Alto Acrux	147,000	LNG Marine Transport	Mitsubishi	Mar-08	Bahamas	S	Moss	4	Various
Amali	148,000	Brunei-Shell	DSME	Jul-11	Brunei	DFDE	GT No. 96	4	Brunei LNG
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
Broog	135,466	J4 Consortium	Mitsui Chiba	May-98	Japan	S	Moss	5	Qatargas
Bu Samara	266,000	QGTC	Samsung	Dec-08	Qatar	DRL	TZ Mk. III	5	Qatargas
BW Suez Paris	162,400	BW Gas	Daewoo	May-09	N.I.S.	DFDE	GT NO 96	4	Yemen-Atlantic
BW Suez Brussels	162,400	BW Gas	Daewoo	May-09	N.I.S.	DFDE	GT NO 96	4	Yemen-Atlantic
Cadiz Knutsen	138,826	Knutsen / Marpetrol	IZAR Puerto Real	Jun-04	Spain	S	GT NO 96	4	Engas
Castillo de Santisteban	173,600	Elcano	STX	Aug-10	Malta	S	GT NO. 96		Various
Castillo de Villalba	138,000	Elcano	IZAR	Nov-03	Spain	S	GT NO 96	4	Sonatrach
Catalunya Spirit	138,000	Teekay LNG Partners	IZAR Sestao	Mar-03	Liberia	S	GT NO 96	4	Atlantic LNG
Celestine River	145,000	KLNG	Kawasaki	Dec-07	Bahamas	S	Moss		Various
Cheikh Bouamama	75,500	Skikda LNG Transport	USC	Jul-08	Bahamas	S	TZ Mk. III	4	Sonatrach
Cheikh El Mokrani	75,500	Med LNG Corp	USC	Jun-07	Bahamas	S	TZ Mk. III	4	Sonatrach
Clean Energy	150,000	Pegasus Shiph'd	Hyundai	Mar-07	Marshall Is.	S	TZ Mk. III	4	Various
Clean Force	150,000	Seacrown Mariti	Hyundai	Jan-08	Marshall Is.	S	TZ Mk. III	4	Various
Clean Ocean	155,900	Dynagas	Hyundai	Mar-14	Marshall Is.	DFDE	TZ Mk. III	4	Various
Clean Planet	155,900	Dynagas	Hyundai	Mar-14	Marshall Is.	DFDE	TZ Mk. III	4	Various
Clean Vision	160,000	Dynagas	Hyundai	Jun-15	Marshall Is.	DFDE	TZ Mk. III	4	Various
Cool Explorer	160,000	Thenamaris	Samsung	Oct-13	Bermuda	DFDE	TZ Mk. III	4	Various
Cool Runner	160,000	Thenamaris	Samsung	May-14	Bermuda	DFDE	TZ Mk. III	4	Various
Cool Voyager	160,000	Thenamaris	Samsung	Oct-13	Bermuda	DFDE	TZ Mk. III	4	Various
Corcovado LNG	160,106	TMSC Gas	Daewoo	Jun-14	Malta	TFDE	GT No 96	4	Various
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
Galia Spirit	140,620	Teekay LNG Partners	Daewoo	Jul-04	Liberia	S	GT NO 96	4	Engas
Gaselys	153,500	GdF/NYK	Atlantique	Mar-07	France	DFDE	CS 1	4	Engas
Gallina	134,425	Shell Shipping	Mitsubishi Nagasaki	Oct-02	Singapore	S	Moss	5	Shell
GasLog Chelsea	153,000	GasLog	Hanjin Korea	Dec-09	Panama	TFDE	TZ Mk. III	4	Various
GasLog Salem	165,000	GasLog	Samsung	Apr-15	Liberia	TFDE	TZ Mk. III	4	various
GasLog Santiago	155,000	GasLog	Samsung	Mar-13	Liberia	TFDE	TZ Mk. III	4	Various
GasLog Saratoga	155,000	GasLog	Samsung	Dec-14	Bermuda	TFDE	TZ Mk. III	4	Various
Gaslog Savannah	155,000	GasLog	Samsung	May-10	Bermuda	DFDE	TZ Mk. III	4	Various
GasLog Seattle	155,000	GasLog	Samsung	Oct-13	Bermuda	TFDE	TZ Mk. III	4	Various
GasLog Shanghai	155,000	GasLog	Samsung	Jan-13	Liberia	TFDE	TZ Mk. III	4	Various
Gaslog Singapore	155,000	GasLog	Samsung	Jul-10	Bermuda	DFDE	TZ Mk. III	4	Various
Gaslog Skagen	155,000	GasLog	Samsung	Oct-13	Bermuda	DFDE	TZ Mk. III	4	Various
Gaslog Sydney	155,000	GasLog	Samsung	May-13	Bermuda	DFDE	TZ Mk. III	4	Various
GDF-Suez Global Energy	74,000	Gaz de France	Chantiers	Dec-06	France	DFDE	CS1	4	Sonatrach
GDF-Suez Cape Ann	145,000	Hoegh LNG/MOL	Samsung	May-10	Liberia	DFDE	TZ Mk. III	4	Various
GDF-Suez Neptune	145,000	Hoegh LNG/MOL	Samsung	Dec-09	Liberia	DFDE	TZ Mk. III	4	Various
GDF-Suez Point Fortin	154,200	LNG Japan	Imabari/Koyo	Feb-10	Panama	DFDE	TZ Mk. III	4	Various
Gemmata	138,100	Shell Shipping	Mitsubishi Nagasaki	Mar-04	Singapore	S	Moss	5	Shell
Ghasha	137,510	National Gas Shipping	Mitsui	Jun-95	Liberia	S	Moss	5	ADGAS
Golar Arctic	140,645	Golar LNG	Daewoo	Dec-03	Marshall Is.	S	GT NO 96	4	Shell Spot
Golar Bear	160,000	Golar	Samsung	Mar-14	Bermuda	DFDE	TZ Mk. III	4	Various

CARRIER FLEET

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
LNG River Niger	141,000	Bonny Gas Transport	Hyundai	May-06	Bermuda	S	Moss	4	Various
LNG River Orashi	145,910	BW Gas	Daewoo	Nov-04	Bermuda	S	GT No 96	4	Nigeria LNG
LNG Rivers	137,231	Bonny Gas Transport	Hyundai	Jun-02	Bermuda	S	Moss	4	Nigeria LNG
LNG Saturn	153,000	MOL	MHI	Nov-15	Japan	S	Moss	4	Various
LNG Sokoto	137,231	Bonny Gas Transport	Hyundai	Aug-02	Bermuda	S	Moss	4	Nigeria LNG
LNG Taurus	126,300	MOL/LNG Japan	GD Quincy	Aug-79	Marshall Is.	S	Moss	5	Various
LNG Venus	155,000	Osaka/MOL	MHI	Oct-14	Japan	S	Moss	4	Various
LNG Vesta	127,547	Tokyo Gas Consortium	Mitsubishi Nagasaki	Jun-94	Japan	S	Moss	4	Pertamina
LNG Virgo	126,400	MOL/LNG Japan	GD Quincy	Dec-79	Marshall Is.	S	Moss	5	Pertamina
Lobito	160,400	Mitsui/NYK/Teekay	Samsung	Oct-11	Bahamas	DFDE	TZ Mk. III	4	Various
Lusail	138,000	Peninsular LNG	Samsung	May-05	Bahamas	S	TZ Mk. III	4	Qatar
Madrid Spirit	138,000	Teekay LNG Partners	IZAR Puerto Real	Jan-05	Spain	S	GT No 96	4	Engas
Magellan Spirit	165,500	Teekay LNG Partners	Samsung	Sep-08	Denmark	DFDE	TZ Mk. III	4	Various
Malanje	160,400	Mitsui/NYK/Teekay	Samsung	Jul-11	Bahamas	DFDE	TZ Mk. III	4	Various
Maran Gas Alexandria	161,870	Maran	Hyundai Samho	Sep-15	Greece	DFDE	TZ Mk. III	4	Various
Maran Gas Apollonia	161,870	Maran	Daewoo	Jan-14	Greece	DFDE	GT No 96	4	Various
Maran Gas Asclepius	145,000	Kristen Navigation	Daewoo	Jul-05	Bermuda	S	GT No 96	4	Qatar
Maran Gas Coronis	145,700	Maran	Daewoo	Sep-07	Greece	S	GT No 96	4	Rasgas II
Maran Gas Delphi	159,800	Maran	Daewoo	Feb-14	Greece	DFDE	GT No 96	4	Various
Maran Gas Efessos	159,800	Maran	Daewoo	Jun-14	Greece	DFDE	GT No 96	4	Various
Maran Gas Lindos	159,800	Maran	Daewoo	Jun-15	Greece	DFDE	GT No. 96	4	Various
Maran Gas Mystras	155,900	Maran Gas	Daewoo	May-15	Greece	DFDE	GT No 96	4	various
Maran Gas Posidonia	161,870	Maran	Daewoo	May-14	Greece	DFDE	GT No 96	4	Various
Maran Gas Sparta	161,870	Maran	Hyundai Samho	April-15	Greece	DFDE	G TZ Mk. III	4	Various
Maran Gas Troy	155,900	Maran Gas	Daewoo	May-15	Greece	DFDE	GT No 96	4	various
Maria Energy	174,000	Tsakos	Hyundai	Mar-15	Marshall Is.	TFDE	GTT Mk II	4	Various
Marib Spirit	165,000	Teekay LNG	Samsung	May-08	Marshall Is.	DFDE	TZ Mk. III	4	Various
Matthew	126,540	Suez LNG Shiping	Newport News	Jun-79	Bahamas	S	TZ Mk. I	6	Atlantic LNG
Mekaines	266,000	Nakililat	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	Nakililat	Hyundai	Mar-09	Liberia	DRL	GT No 96	4	Qatar-Atlantic Basin
Methane Alison Victoria	145,000	GasLog	Samsung	Aug-07	Bermuda	S	TZ III	4	Eq.Guinea LNG
Methane Becki Anne	170,000	GasLog	Samsung	Sep-10	Bermuda	TFDE	TZ Mk. III	4	Various
Methane Heather Sally	145,000	GasLog	Samsung	Jul-07	Bermuda	S	Tz Mk. III	4	Eq.Guinea LNG
Methane Jane Elizabeth	145,000	GasLog	Samsung	Jun-06	Bermuda	TFDE	TZ Mk. III	4	Engas
Methane Julia Louise	170,000	GasLog	Samsung	Dec-09	Bermuda	TFDE	TZ Mk. III	4	Various
Methane Kari Elin	138,200	Shell	Samsung	Jun-04	Bermuda	S	TZ Mk. III	4	Various
Methane Lake Charles	145,000	Shell	Samsung	Feb-07	Bermuda	S	TZ Mk. III	4	Marathon Oil
Methane Lydon Volney	145,000	Shell	Samsung	Aug-06	Bermuda	S	TZ Mk. III	4	Engas
Methane Mickie Harper	170,000	Shell-GasLog	Samsung	Nov-10	Bermuda	TFDE	TZ Mk. III	4	Various
Methane Nile Eagle	145,000	Shell-GasLog	Samsung	Dec-07	Bermuda	S	TZ Mk. III	4	Engas
Methane Patricia Camila	170,000	Shell-GasLog	Samsung	Oct-10	Bermuda	TFDE	TZ Mk. III	4	Various
Methane Princess	138,159	Golar LNG	Daewoo	2003	UK	S	GT No 96	4	Spot BG
Methane Rita Andre	145,000	GasLog	Samsung	Mar-06	Bermuda	S	TZ Mk. III	4	Engas
Methane Shirley Elizabeth	145,000	GasLog	Samsung	Apr-07	Bermuda	S	TZ Mk. III	4	Marathon Oil
Methane Sprit	165,000	Teekay LNG	Samsung	Mar-08	Singapore	DFDE	TZ Mk. III	4	Various
Methania	131,230	Distrigas	Boelwerf	Oct-78	Belgium	S	GT No 85	5	Sonatrach
Milaha Qatar	145,000	Milaha	Samsung	Apr-06	Denmark	S	TZ Mk. III	4	Qatar
Milaha Ras Laffan	138,270	Milaha	Samsung	Mar-04	Denmark	S	TZ Mk. III	4	RasGas II
Min Lu	147,000	China Ships	Hudong	Aug-09	China	S	GT No 96	4	Various
Min Rong	147,000	China LNG Ships	Hudong	Feb-09	Hong Kong	S	GT No 96	4	Australia-China
Mostefa Ben Boulaid	125,260	SNTM-Hyproc	La Ciotat	Aug-76	Algeria	S	TZ Mk. I	6	Sonatrach
Mourad Didouche	126,130	SNTM-Hyproc	Atlantique	Jul-80	Algeria	S	GT No 85	5	Sonatrach
Mozah	266,000	QGTC	Samsung	Aug-08	Qatar	DRL	TZ Mk III	5	Qatargas II
Mraweh	137,000	National Gas Shipping	Kvaerner-Masa	Jun-96	Liberia	S	Moss	4	ADGAS
Mubaraz	137,000	National Gas Shipping	Kvaerner-Masa	Jan-96	Liberia	S	Moss	4	Various
Muraq	210,100	J5-K Line	Daewoo	May-08	Marshall Is.	DRL	GT No 96	4	Qatar-Atl'c Basin
Murwab	210,100	J5 Consortium	Daewoo	May-08	Marshall Is.	DRL	GT No. 96	4	Qatargas
Muscat LNG	149,170	Oman Gas/MOL	Kawasaki Sakaide	Mar-04	Japan	S	Moss	4	Oman Gas
Neo Energy	149,700	Tsakos	Hyundai	Feb-07	Liberia	S	GTT Mk II	4	Various
Nizwah LNG	145,000	Oryx LNG Carriers	Kawasaki Sakaide	Dec-05	Japan	S	Moss	4	Oman Gas
Northwest Sanderling	127,525	Australia LNG	Mitsubishi Nagasaki	Jun-89	Australia	S	Moss	4	NWS
Northwest Sandpiper	127,500	Australia LNG	Mitsui Chiba	Feb-93	Australia	S	Moss	4	NWS
Northwest Seaeagle	127,450	Australia LNG	Mitsubishi Nagasaki	Nov-92	Bermuda	S	Moss	4	NWS
Northwest Shearwater	127,500	Australia LNG	Kawasaki Sakaide	Sep-91	Bermuda	S	Moss	4	NWS
Northwest Snipe	127,747	Australia LNG	Mitsui Chiba	Sep-90	Australia	S	Moss	4	NWS
Northwest Stormpetrel	127,600	Australia LNG	Mitsubishi Nagasaki	Dec-94	Australia	S	Moss	4	NWS
Northwest Swallow	127,708	J3 Consortium	Mitsui Chiba	Nov-89	Japan	S	Moss	4	NWS
Northwest Swan	138,000	Australia LNG	Daewoo	Mar-04	Australia	S	GT NO 96	4	NWS
Northwest Swift	127,590	J3 Consortium	Mitsubishi Nagasaki	Sep-89	Japan	S	Moss	4	NWS
Ob River	150,000	Lance Shipping	Hyundai	Oct-07	Marshall Is.	S	TZ Mk. III	4	Various
Onaiza	210,100	Nakilat	Daewoo	Apr-09	Liberia	DRL	GT NO 96	4	Qatar-Atlantic Basin
Pacific Arcadia	147,200	NYK Line	MHI	Oct-14	Bahamas	S	KM		Various
Pacific Enlighten	145,000	LNG MT	Mitsubishi	Mar-09	Japan	S	Moss	4	Various
Pacific 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

CARRIER FLEET

Puteri Delima	130,400	MISC	Atlantique	Jan-95	Malaysia	S	GT NO 96	4	Petronas
Puteri Delima Satu	137,100	MISC	Mitsui Chiba	Apr-02	Malaysia	S	GT NO 96	4	Petronas
Puteri Firuz	130,400	MISC	Atlantique	May-97	Malaysia	S	GT NO 96	4	Petronas
Puteri Firuz Satu	137,100	MISC	Mitsubishi Nagasaki	Sep-04	Malaysia	S	GT NO 96	4	Petronas
Puteri Intan	130,400	MISC	Atlantique	Aug-94	Malaysia	S	GT NO 96	4	Petronas
Puteri Intan Satu	137,100	MISC	Mitsubishi Nagasaki	Dec-01	Malaysia	S	GT NO 96	4	Petronas
Puteri Mutiera Satu	137,100	MISC	Mitsui Chiba	Apr-05	Malaysia	S	GT NO 96	4	Petronas
Puteri Nilam	130,400	MISC	Atlantique	Jun-95	Malaysia	S	GT NO 96	4	Petronas
Puteri Nilam Satu	137,100	MISC	Mitsubishi Nagasaki	Sep-03	Malaysia	S	GT NO 96	4	Petronas
Puteri Zamrud	130,400	MISC	Atlantique	May-96	Malaysia	S	GT NO 96	4	Petronas
Puteri Zamrud Satu	137,100	MISC	Mitsui Chiba	Apr-87	Malaysia	S	GT NO 96	4	Atlantic LNG
Raahi	136,000	Petronet LNG Ltd	Daewoo	Dec-04	Malta	S	GT NO 96	4	Qatargas
Ramdane Abane	126,130	SNTM-Hyproc	Atlantique	Jul-81	Algeria	S	GT NO 85	5	Sonatrach
Rasheeda	266,000	QGTC	Samsung	Jun-10	Liberia	DRL	TZ Mk. III		Various
Ribera del Duero Knutsen	173,400	Knutsen	Daewoo	Nov-10	Nor-NIS	DFDE	GT NO. 96	4	Various
Salalah LNG	147,000	Oman Gas/MOL	Samsung	Dec-05	Japan	S	TZ Mk. III	4	Oman
SCF Polar	71,500	Sovcomflot	Kockums	Aug-69	Liberia	S	GT NO 82	6	Sonatrach
Seishu Maru	162,000	K Line-Transpacific	Kawasaki Sakaide	Jan-15	Panama	S	Moss	4	Australia-Japan
Seri Alam	138,000	MISC	Samsung	Oct-05	Malaysia	S	TZ Mk. III	4	Yemen LNG
Seri Amanah	145,000	MISC	Samsung	Mar-06	Malaysia	S	TZ Mk. III	4	Yemen LNG
Seri Anggun	145,000	MISC	Samsung	Nov-06	Malaysia	S	TZ Mk. III	4	Yemen LNG
Seri Angkasa	145,000	MISC	Samsung	Feb-07	Malaysia	S	TZ Mk. III	4	Petronas
Seri Ayu	145,000	MISC	Samsung	Oct-07	Malaysia	S	TZ Mk. III	4	Various
Seri Bakti	152,300	MISC	Mitsubishi	Mar-07	Malaysia	S	GT NO 96	4	Petronas
Seri Balhaf	152,000	MISC	Mitsubishi	Sep-08	Malaysia	S	GT NO 96	4	Various
Seri Balquis	152,000	MISC	Mitsubishi	Dec-08	Malaysia	S	GT NO 96	4	Various
Seri Begawan	152,300	MISC	Mitsubishi	Dec-07	Malaysia	S	GT NO 96	4	Various
Seri Bijaksana	152,300	MISC	Mitsubishi	Feb-08	Malaysia	S	GT NO 96	4	Petronas
Sevilla Knutsen	173,400	Knutsen	Daewoo	Jun-10	N.I.S.	DFDE	GT NO 96	4	Various
Shahamah	135,500	National Gas Shipping	Kawasaki Sakaide	Oct-94	Liberia	S	Moss	5	ADGAS
Shangra	266,000	QGTC	Samsung	Nov-09	Liberia	DRL	TZ Mk. III	5	Qatargas IV
Shen Hai	147,100	China LNG	Hudong Zhonghua	Sep-12	China	AB/CC Steam	GT NO 96	4	Various
Simaisma	147,700	Maran Gas Maritime	Daewoo	Jul-06	Greece	S	GT No 96	4	Qatar
SK Splendor	138,375	SK Shipping	Samsung	Mar-00	Panama	S	TZ Mk. III	4	Oman Gas
SK Stellar	138,375	SK Shipping	Samsung	Dec-00	Panama	S	TZ Mk. III	4	RasGas
SK Summit	138,000	SK Shipping	Daewoo	Aug-99	Panama	S	GT NO 96	4	RasGas
SK Sunrise	138,306	I. S. Carriers	Samsung	Sep-03	Panama	S	TZ Mk. III	4	RasGas
SK Supreme	138,200	SK Shipping	Samsung	Jan-00	Panama	S	TZ Mk. III	4	RasGas
Sohar LNG	137,250	Oman Gas/ MOL	Mitsubishi Nagasaki	Oct-01	Malta	S	Moss	5	Oman Gas
Solaris	155,000	GasLog	Samsung	Jul-14	Bermuda	TFDE	TZ Mk. III	4	Various
Sonangol Benguela	160,500	Sonangol	Daewoo	Sep-11	Bahamas	S	GT No. 96	4	Angola LNG
Sonangol Etosha	160,500	Sonangol	Daewoo	Sep-11	Bahamas	S	GT No. 96	4	Angola LNG
Sonangol Sambizanga	160,500	Sonangol	Daewoo	Sep-11	Bahamas	S	GT No. 96	4	Angola LNG
Southern Cross	172,000	MOL	Hudong	May-15	Hong Kong	DRL	GT NO. 96	4	Various
Soyo	160,400	Mitsui/NYK/Teekay	Samsung	May-11	Bahamas	DFDE	TZ Mk. III	4	Various
Spirit of Hela	177,000	MOL	Hyundai	Oct-09	Panama	DFDE	TZ Mk. III	4	Various
Stena Blue Sky	145,700	Stena	Daewoo	Jan-06	Panama	S	GT No 96	4	Various
Stena Clear Sky	171,800	Stena	Daewoo	Sep-10	Panama	DFDE	GT NO 96	4	Various
Stena Crystal Sky	171,800	Stena	Daewoo	Jul-10	Panama	DFDE	GT NO 96	4	Various
STX Kolt	145,700	STX Panocean	Korea Hanjin	Nov-08	Panama	DFDE	TZ Mk. III	4	Various
Suez Point Fortin	154,200	Trinity LNG	Koyo Japan	Nov-09	Panama	S	TZ Mk. III	4	Yemen LNG
Taitar No. 1	145,000	NYK Line	Mitsubishi	Oct-09	Liberia	S	Moss	4	Various
Taitar No. 3	145,000	NYK Line	Mitsubishi	Jan-10	Liberia	S	Moss	4	Various
Taitar No. 4	145,000	NYK	Mitsubishi	Jan-10	Liberia	S	Moss	4	Various
Tangguh Batur	145,700	Sovcomflot/NYK	Daewoo	Dec-08	Cyprus	S	GT NO 96		Tangguh
Tangguh Foja	155,000	K Line	Samsung	Jul-08	Panama	DFDE	TZ Mk. III	4	Tangguh LNG
Tangguh Hiri	155,000	Teekay LNG	Hyundai	Nov-08	IOM	DFDE	TZ Mk. III	4	Tangguh
Tangguh Jaya	145,700	K Line	Samsung	Nov-08	Panama	DFDE	TZ Mk. III	4	Tangguh
Tangguh Palung	155,000	K Line	Samsung	Mar-09	Panama	DFDE	TZ Mk. III	4	Tangguh
Tangguh Sago	155,000	Teekay LNG	Hyundai	Mar-09	IOM	DFDE	TZ Mk. III	4	Tangguh LNG
Tangguh Towuti	145,700	Sovcomflot/NYK	Daewoo	Oct-08	Cyprus	S	GT NO 96	4	Tangguh
Tembek	216,200	OSG/Nakilat	Samsung	Sep-07	Marshall Is.	DRL	TZ Mk. III	4	Qatargas II
Tenaga Satu	130,000	MISC	Dunkerque	Sep-82	Malaysia	S	GT NO 88	5	Petronas
Trinity Arrow	154,900	K Line	Imabari Shipbuilding	Mar-08	Panama	S	TZ Mk. III	4	Various
Umm Al Amad	210,100	J5	Daewoo	Aug-08	Marshall Is.	DRL	GT NO 96	4	Ras Gas III
Umm Al Ashtan	137,000	National Gas Shipping	Kvaerner- Masa	May-97	Liberia	S	Moss	4	ADGAS
Umm Bab	145,000	Kristen Navigation	Daewoo	Nov-05	Bermuda	S	GT NO 96	4	Qatargas
Umm Slaal	266,000	QGTC	Samsung	Nov-08	Qatar	DRL	TZ Mk. III	5	Qatargas
Valencia Knutsen	173,400	Knutsen	Daewoo	Sep-10	Nor-NIS	DFDE	GT NO. 96	4	Various
Velikiy Novgorod	170,200	SovComFlot	STX	Feb-14	Liberia	DFDE	GT No. 96	4	Various
Wakaba Maru	125,000	J3 Consortium	Mitsui Chiba	Apr-85	Japan	S	Moss	5	Pertamina
WilEnergy	125,500	Awilco LNG	Mitsubishi	Oct-83	NIS	S	Moss	5	Various
WilForce	156,000	Teekay LNG	Daewoo	Aug-13	NIS	DFDE	GT NO 96	4	Various
WilGas	125,500	Awilco LNG	Mitsubishi	Jul-84	NIS	S	Moss	5	Various
WilPower	125,500	Awilco LNG	Mitsubishi	Jul-84	NIS	S	Moss	5	Various
Woodside Donaldson	165,500	Teekay LNG	Samsung	Dec-09	Singapore	DFDE	TZ Mk. III	4	Various
Woodside Goode	159,800	Maran	Daewoo	Jul-14	Greece	DFDE	GT No. 96	4	Various
Woodside Rogers	155,900	Maran Gas	DSME	Jul-13	Greece	DFDE	GT NO 96	4	Various
Yari LNG	159,983	TMSC Gas	Daewoo	Jun-14	Malta	TFDE	GT No 96	4	Various
Yenisei River	155,000	Dynagas	Hyundai	Jul-13	Marshall Is.	DFDE	TZ Mk. III	4	Various
YK Sovereign	127,125	SK Shipping	Hyundai	Dec-94	Panama	S	Moss	4	Pertamina
Zarga	266,000	QGTC	Samsung	Dec-09	Liberia	DRL	TZ Mk. III	5	Qatar-Atlantic
Zekreet	135,420	J4 Consortium	Mitsui Chiba	Dec-98	Japan	S	Moss	5	Qatargas

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

LNG Import Terminals

Explanatory Notes

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

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

Country	Location (Project)	Owners	Start up	Storage	
				Tanks	Capacity
Belgium	Zeebrugge	Fluxys	1987	4	380,000
Canada	Canaport Saint John	Irving Oil, Repsol	2009	3	480,000
Chile	Quintero	ENAP, Metrogas, Enagas	2009	3	334,000
	Mejillones	Engie, Codelco	2010	1	175,000
China	Beihai LNG, Guangxi	Sinopec	2015	2	320,000
	Dalian	PetroChina	2011	3	480,000
	Dongguan, Guangdong	Jovo Group	2013	2	160 000
	Fujian LNG (Xiuyu)	CNOOC, Fujian I&D Corp.	2008	2	640,000
	Guangdong	CNOOC,BP	2006	3	480,000
	Haikou, Hainan LNG	CNOOC	2014	3	480,000
	Ningbo, Zhejiang	CNOOC, Zhejiang Energy	2012	3	480,000
	Qingdao, Shandong	Sinopec	2014	3	480,000
	Rudong	PetroChina	2011	2	320,000
	Shanghai	CNOOC, Shenergy Group	2009	3	495,000
	Shanghai, Mengtougou	Shanghai Gas	2008	3	120 000
	Tangshan, Hebei	PetroChina	2013	3	480,000
	Tianjin FSRU	CNOOC	2014	1	60,000
	Zhuhai, Gaolan	CNOOC	2013	3	480,000
Dominican Republic	Punta Caucedo	AES Andres	2003	1	160 000
France	Fos Tonkin	Elengy	1972	3	150,000
	Montoir-de-Bretagne	Elengy	1980	3	360,000
	Fos Cavaou	Engie, Total	2010	3	330,000
Greece	Revithoussa	DEPA	2000	2	130,000
India	Dabhol	GAIL, NTPC (Ratnagiri Gas & Power)	2009	3	480,000
	Dahej	Petronet LNG	2004	4	592,000
	Hazira	Shell India, Total	2005	2	320,000
	Kochi, Kerala	Petronet LNG	2013	2	320,000
Indonesia	Arun	Pertamina	2015	5	507,000
Italy	Panigaglia	Snam	1969	2	100,000
	Porto Levante (offshore GBS)	ExxonMobil, Qatar Petroleum, Edison Gas	2009	2	250,000
Japan	Negishi	Tokyo Gas	1969	14	1,180,000
	Sodegaura	Tokyo Gas	1973	35	2,660,000
	Ohgishima	Tokyo Gas	1998	4	850,000
	Higashi-Ohgishima	Tokyo Electric	1984	9	540,000
	Futtsu	Tokyo Electric	1985	10	1,110,000
	Yokkaichi LNG	Chubu Electric	1988	4	320,000
	Kawagoe	Chubu Electric	1997	6	840,000
	Yokkaichi Works	Toho Gas	1991	2	160,000
	Chita LNG Joint	Toho Gas, Chubu Electric	1978	4	300,000
	Chita LNG	Toho Gas, Chubu Electric	1983	7	640,000
	Chita - Midorihama	Toho Gas	2001	2	400,000
	Senboku I	Osaka Gas	1972	4	180,000
	Senboku II	Osaka Gas	1977	18	1,585,000
	Himeji	Osaka Gas	1984	8	740,000
	Himeji LNG	Kansai Electric	1979	7	520,000
	Yanai	Chugoku Electric	1990	6	480,000
	Niigata	Nihonkai LNG, Tohoku Electric	1984	8	720,000
	Oita	Oita Gas, Kyushu Electric	1990	5	460,000
	Tobata	Kitakyushu LNG	1977	8	480,000
	Fukuoka	Saibu Gas	1993	2	70,000
	Sodeshi	Shizuoka Gas	1996	3	337,200
	Hatsukaichi	Hiroshima Gas	1996	2	170,000
	Kagoshima	Nippon Gas	1996	2	136,000
	Shin-Minato	Sendai City Gas	1997	1	80,000
	Nagasaki	Saibu Gas	2003	1	36,000
	Sakai	Kansai Electric, Cosmo Oil	2006	3	420,000
	Mizushima	Nippon Oil, Chugoku Electric	2006	2	320,000
	Sakaide	Shikoku Electric, Cosmo Oil	2011	1	180,000
	Ishikari LNG	Hokkaido Gas, Tokyo Gas	2012	1	180,000
	Okinawa	Okinawa Electric Power	2012	2	280,000
	Naoetsu	Inpex	2013	2	360,000
	Joetsu	Chubu	2011	3	540,000
	Hachinohe LNG	Nippon Oil	2015	2	280,000
	Hitachi LNG	Tokyo Gas	2015	1	230,000
Korea	Incheon	Kogas	1996	20	2,880,000
	Kwangyang	POSCO	2005	4	530,000
	Pyeong-Taek	Kogas	1986	23	3,360,000
	Samcheok	Kogas	2014	3	600,000
Mexico	Tong-Yeong	Kogas	2002	17	2,620,000
	Altamira	Vopak, Enagas	2006	2	300,000
	Energia Costa Azul	Sempre LNG	2008	2	320,000
Netherlands	Manzanillo	Samsung, Kogas, Mitsui	2012	2	300,000
	Gate LNG	Gasunie, Royal Vopak	2011	3	540,000
Poland	Swinoujscie	Baltic Gaz System	2015	2	320,000
Portugal	Sines	REN Atlantico	2004	3	390,000
Puerto Rico	Penuelas	EcoElectrica	2000	1	160,000
Singapore	Singapore	Singapore Energy Authority	2013	3	540,000

LNG Import Terminals (continued)

Country	Location (Project)	Owners	Start up	Tanks	Storage Capacity
Spain	Barcelona	Enagas	1969	8	840,000
	Huelva	Enagas	1988	5	610,000
	Cartagena	Enagas	1989	5	587,000
	Bilbao	Enagas, EVE	2003	3	450,000
	Sagunto	GNF, Osaka Gas, Oman Oil	2006	4	600,000
	Reganosa, Ferrol	GNF, Sonatrach, Tojeiro	2006	2	300,000
	El Musel, Gijón,	Enagas	2013	2	300,000
Taiwan	Yung-An	CPC	1990	6	690,000
	Tai-chung	CPC	2009	3	480,000
Thailand	Map Ta Phut	PTT LNG	2011	2	320,000
Turkey	Marmara Ereglisi	Botas	1994	3	255,000
	Izmir	EgeGaz	2006	2	280,000
USA	Everett	Suez LNG NA	1971	2	155,000
	Lake Charles	Shell, ETE	1982	4	425,000
	Elba Island	Kinder	2001	5	535,000
	Cove Point	Dominion	2003	5	530,000
	Freeport	Freeport LNG Development	2008	2	320,000
	Cameron	Sempra LNG	2009	3	480,000
	Golden Pass, TX	Qatar Petroleum, ExxonMobil	2010	5	775,000
	Pascagoula, MS	Gulf LNG, Kinder	2012	2	320,000
UK	Isle of Grain	National Grid	2005	8	1,000,000
	South Hook	ExxonMobil, Qatar Petroleum, Total	2009	5	775,000
	Dragon LNG, Milford Haven	Shell, Petronas	2009	2	310,000

LNG Import Terminal Projects

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

LNG FSRU Import Facilities

Country	Location (Project)	Owners	Start up
Argentina	Bahia Blanca GasPort	Excelerate/YPF Repsol	2008
	Escobar GasPort	Excelerate/Enarsa	2011
Brazil	Pecem, FSRU	Petrobras	2009
	Guanabara Bay FSRU	Petrobras	2009
	Salvador, Bahia FSRU	Petrobras	2013
Dubai	Jebel Ali Port	DSA of UAE	2010
Egypt	Ain Sokhna, Suez	EGAS, Hoegh	2015
	Ain Sokhna, Suez	EGAS, Golar	2015
Indonesia	Lampung	Hoegh LNG, PGN LNG	2014
	Nusantara (Jakarta Bay)	Golar LNG, Pertamina	2012
Italy	Livorno	OLT Offshore LNG Toscana	2013
Jordan	Aqaba, Jordan	Golar LNG	2015
Kuwait	Mina Al-Ahmadi	KPC	2009
Lithuania	Klaipeda	Klaipedos Nafta Hoegh LNG	2014
Malaysia	Malacca FSRU	Petronas	2012
Pakistan	Port Qasim	Excelerate, Engro Corp	2015
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.	2020	4	24.0
	Bear Head LNG, Nova Scotia	LNG Ltd.	2020	4	8.0
	Canaport LNG, New Brunswick	Repsol Irving Oil	2020	studies	
	Cedar 1, 2, 3, Kitimat area	LNG Export Ltd (Haisla)	2020	studies	
	Douglas Channel LNG Bish Cove	Exmar, EDF, ItaGas, Idemitsu	2018	1	1.0
	GNL Quebec, Saquenay	Freestone Capital and Breyer Capital	2020	4	10.0
	Goldboro LNG, Nova Scotia	Pieridae Energy	2020	2	10.0
	Grassy Point LNG	Woodside Petroleum	2020	studies	
	Kitimat LNG, BC	Woodside, Chevron	2020	2	10.0
	LNG Canada, BC	Shell, Mitsubishi, Kogas, PetroChina	2020	2	12.0
	Melford LNG project, Nova Scotia	H-Energy Hiranandani Group	Studies		
	Pacific Northwest LNG, BC	Petronas, Japex, Sinopec, Indian Oil, Brunei Petroleum	2019	2	12.0
	Shell Prince Rupert LNG, BC	Shell	2020	3	21.0
	Steelhead LNG, Bamfield	Steelhead LNG Corp	2020	2	12.00
	Vancouver Tilbury	WesPac Midstream	2020	1	3.25
EQ.GUINEA	Equatorial Guinea Fortuna FLNG	Ophir and Golar LNG	2019	1	2.0
INDONESIA	Abadi FLNG	Inpex, Shell	2019	2	7.5
	Sengkang LNG	Energy World Corp.	2016	4	2.0
MALAYSIA	Bintulu Train 9	Petronas	2016	1	3.6
	Kanowit FLNG (Sarawak)	Petronas	2016	1	1.2
	Rotan FLNG (Sabah)	Petronas	2017	1	1.5
MOZAMBIQUE	Area 1 Onshore	Anadarko Petroleum and partners	2018	2	10
	Area 4 Onshore	Eni and partners	2020	2	10
	Area 4 FLNG	Eni and partners	2019	1	2.5
NIGERIA	NLNG Train 7	NNPC, Shell, BP, Total	2020+	1	8.4
	Olokola LNG	NNPC, Chevron, Shell	2020+	4	20.0
PAPUA NEW GUINEA	Elk-Antelope LNG	Total, InterOil, Oil Search, Petromin	Studies		
RUSSIA	Shtokman LNG Murmansk	Gazprom, Statoil, Total	2019	4	20.0
	Yamal LNG Siberia	Novatek, Gazprom, Total	2018	3	16.5
	Sakhalin II expansion	Gazprom, Shell, Mitsui, Mitsubishi	2017+	studies	
	Vladisvostok LNG	Gazprom, Itochu, various	2018	2	10.0
USA	Alaska LNG Nikiski	ExxonMobil, BP, ConocoPhillips, Alaska State	2020	3	20.0
	Annova LNG, Brownsville	Exelon Corp.	2020	6	6.0
	Cameron LNG, Louisiana	Sempra	2018	5	24.92
	Corpus Christi Liquefaction, Texas	Cheniere	2019	5	22.5
	Cove Point LNG, Maryland	Dominion	2018	1	5.25
	Delfin LNG Louisiana	Delfin, Hoegh	2020	3	9.0
	Freeport LNG, Texas	Freeport LNG	2018	4	20.4
	Golden Pass, Texas	Qatar Petroleum, ExxonMobil	2020	3	15.6
	Jordan Cove Energy	Veresen Inc.	2020	2	6.8
	Lake Charles, Louisiana	Shell, ETE	2019	3	15.0
	Live Oak LNG	Parallax	2020	1	5.0
	Louisiana LNG Energy (Mississippi R.)	Parallax, Cheniere	2020	3	6.0
	Magnolia LNG	Louisiana LNG Ltd.	2019	4	8.0
	Oregon LNG	Leucadia Corp.	2020	2	9.6
	Port Arthur LNG	Sempra	2020	2	10.0
	Rio Grande LNG	NextDecade	2020	6	27.0
	Sabine Pass LNG, Louisiana	Cheniere	2016-19	5	22.5
	Southern LNG	Kinder Morgan	2019	4	2.0
	Texas LNG Brownsville	Chandra, Meyer, Samsung, others	2020	2	4.0
	VG LNG (Cameron Parish)	Venture Global	2019	10	10.0
	VG LNG (Plaquemines)	Venture Global	2019	10	20

LNG Exporters

Country	Location/Project	Shareholders	Start up	Liquefaction		Storage	
				Trains	capacity (nominal) mtpa	No. of tanks	Total capacity m³
ABU DHABI (UAE)	Das Island (Adgas)	ADNOC, Mitsui, BP, Total	1977 1994	2 1	3.2 2.5	3	240,000
ALGERIA	Arzew	Sonatrach GL4Z	1964	3	1.1	3	35,000
	Arzew	Sonatrach GL1Z	1978	6	7.8	3	300,000
	Arzew	Sonatrach GL2Z	1980	6	8.0	3	300,000
	Arzew	Sonatrach	2014	1	4.7		
	Skikda	Sonatrach GL1K II	1980	3	3.0	5	308,000
	Skikda	Sonatrach (rebuild)	2013	1	4.5		
ANGOLA	Soyo	Sonangol, Chevron, BP, ENI, Total	2012	1	5.2	2	370,000
AUSTRALIA	Karratha	NWS Woodside, Shell, BHP	1989	2	5.0	4	260,000
		(BP, Chevron	1992	1	2.5	1	130,000
		(Mitsubishi/Mitsui)	2004	1	4.4	1	130,000
		NWS partners	2008	1	4.4	1	130,000
		Darwin (Bayu Undan) ConocoPhillips, Santos, Eni, Inpex, TEPCO, Tokyo Gas	2006	1	3.5	1	188,000
	Australia Pacific LNG Gladstone LNG Gorgon LNG Pluto LNG QCLNG	ConocoPhillips, Origin Energy, Sinopec	2016	2	7.5	2	320,000
		Santos, Petronas, Total, Kogas	2015	2	7.8	2	280,000
		Chevron, Shell, ExxonMobil	2016	3	15.6	2	360,000
		Woodside, Tokyo Gas, Kansei	2012	1	4.8	2	240,000
		Shell, CNOOC	2014	2	8.0	2	280,000
BRUNEI	Lumut	Brunei/Shell/Mitsubishi/Total	1972-74	5	7.2	3	176,000
EGYPT	Damietta	Union Fenosa, EGPC, EGAS	2004	1	5.0	2	300,000
	Idku	EGPC, EGAS, Shell, Engie, Petronas	2005	2	7.2	2	280,000
EQ.GUINEA	Bioko Island	Marathon, Sonagas, Mitsui, Marubeni	2007	1	3.4	2	272,000
INDONESIA	Bontang I	Pertamina, VICO, JILCO, Total	1977	2	5.2	5	635,000
	Bontang II		1983	2	5.2		
	Bontang III		1989	1	2.8		
	Bontang IV		1993	1	2.8		
	Bontang V		1997	1	2.8		
	Bontang VI		1999	1	3.0		
	Sulawesi LNG	Medco Energi, Pertamina, Mitsubishi	2015	1	2.0	1	170,000
	Tangguh	BP, MI Berau, CNOOC, Nippon, LNG Japan	2008	2	7.6	2	340,000
LIBYA	Marsa el Brega	Sirte Oil (NOC/Shell upgrading)	1970	2	(2.5)	2	96,000
MALAYSIA	Bintulu (MLNG Satu)	Petronas, Sarawak, Mitsubishi	1983	3	8.1	4	260,000
	Bintulu (MLNG Dua)	Petronas, Shell, Sarawak, Mitsubishi	1995	3	7.8	1	65,000
	Bintulu (MLNG Tiga)	Petronas, Shell, Sarawak, Mitsubishi, Nippon Oil	2003	2	6.8	1	120,000
NIGERIA	Bonny Island	NNPC, Shell, Total, Eni	1999	2	6.4	2	168,400
		Nigeria LNG (formed by above)	2002	1	3.2	1	84,200
		Nigeria LNG	2006	2	8.2		
		Nigeria LNG	2008	1	4.1	1	84,200
NORWAY	Snøhvit/Melkoya Island	Statoil, Total, GDF-Suez, Petoro	2007	1	4.2	2	280,000
OMAN	Oman LNG	Oman Govt., Shell, Total, Korea LNG	2000	2	7.1	2	240,000
		Mitsubishi, Mitsui, Partex and Itochu					
		Oman Govt., Oman LNG Union Fenosa, Osaka Gas, & Itochu	2006	1	3.7	2	240,000
PAPUA NEW GUINEA	PNG LNG	ExxonMobil, Oil Search, Santos, JX Nippon Oil	2014	2	6.9	2	320,000
PERU	Peru LNG	Hunt Oil, Shell, Marubeni, SK Group	2010	1	4.4	2	260,000
QATAR	Qatargas 1-T1&2	QP, ExxonMobil, Total, Marubeni, Mitsui	1997	2	6.4	4	340,000
	Qatargas 1-T3	QP, ExxonMobil, Total, Marubeni, Mitsui	1999	1	3.1		
	Qatargas II-T1	QP, ExxonMobil	2009	1	7.8		
	Qatargas II-T2	QP, ExxonMobil, Total	2009	1	7.8	8	1,160,000
	Qatargas III-T1	QP, ConocoPhillips, Mitsui	2010	1	7.8		
	Qatargas IV-T1	QP, Shell	2010	1	7.8		
	RasGas I- T1&2	QP, ExxonMobil, Kogas, Itochu, LNG Japan	1999	2	6.6		
	RasGas II- T3	QP, ExxonMobil	2004	1	4.7	6	840,000
	RasGas II- T4	QP, ExxonMobil	2005	1	4.7		
	RasGas II- T5	QP, ExxonMobil	2007	1	4.7		
	Rasgas III – T6	QP, ExxonMobil	2009	1	7.8		
	Rasgas III – T7	QP, ExxonMobil	2010	1	7.8		
RUSSIA	Sakhalin Island	(Sakhalin Energy) Gazprom, Shell, Mitsui, Mitsubishi	2009	2	9.6	2	200,000
TRINIDAD & TOBAGO	Point Fortin Train 1	BP, Shell, Suez, NGC	1999	1	3.0	2	204,000
	Train 2	BP, Shell	2002	1	3.3	1	160,000
	Train 3	BP, Shell	2003	1	3.3	1	160,000
	Train 4	BP, Shell, NGC	2005	1	5.2	1	160,000
USA	Cheniere Sabine Pass	Cheniere Energy	2016	1	4.5	5	800,000
	Kenai - Alaska	ConocoPhillips, Marathon Oil	1969	2	1.3	3	108,000
YEMEN	Bal-Haf	Yemen LNG, Total, Yemen Gas, Hunt Oil, SK Group, Hyundai	2009	2	6.7	2	320,000

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Brownfield Project Delivery through APCI and Optimized Cascade

WorleyParsons carries out brownfield operations on APCI and CoP Optimized Cascade projects, ensuring project continuity over the complete lifespan of LNG projects



WorleyParsons brings global experience in LNG capacity expansion projects that varies in scope from debottlenecking to adding liquefaction, trains and associated facilities including feed gas treatment and liquefaction, storage, loading and utilities.

Using the knowledge accumulated from over 290 international alliances and long-term contracts, we have developed a culture and a suite of unique tools, systems and delivery methodologies that incorporate industry best practice to drive innovation, efficiency and performance.



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