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LNG exports from US and Russia to help create new gas world order

Latest report from International Energy Agency outlines wider role for flexible and abundant gas in energy transition

A new natural gas world order is emerging as US liquefied natural gas production helps to accelerate a shift towards a more flexible, liquid and global market, accompanied by new Russian shipments of LNG to Asia and by future pipeline volumes.

The France-based International Energy Agency said in its World Energy Outlook that LNG would account for almost 90 percent of the projected growth in long-distance natural gas trade from now until 2040.

Qualities

"Ensuring that gas remains affordable and secure, beyond the current period of ample supply and lower prices, is critical for its long-term prospects," the IEA stated.

However, the IEA added that with few exceptions - most notably the route that opens up between Russia and China - major new pipelines will struggle in a world that "prizes the optionality" of LNG.

"The transformation in gas markets is advanced by market liberalisation in Japan and other Asian economies and by the rise of portfolio players - large companies with a range of supply assets," it said.

"New buyers, often smaller scale, are appearing. The number of LNG-importing countries has risen from 15 in 2005 to 40 today," explained the report.

"Gas supply also becomes more diverse as the amount of liquefaction sites worldwide doubles to 2040, with the main additions coming from the US and Australia, followed by Russia, Qatar, Mozambique and Canada," the IEA said.

"Price formation is based increasingly on competition between various sources of gas, rather than indexation to oil.

"With destination flexibility, hub-based pricing and spot availability, US LNG acts as a catalyst for many of the



The new Yamal LNG export plant in the Russian Arctic region

anticipated changes in the wider gas market," it added.

Dividends

"The new gas order can bring dividends for gas security, although there is the risk of a hard landing for gas markets in the 2020s if uncertainty over the pace or direction of change deters new investments," the report stated.

The IEA added that in resource-rich regions, such as the Middle East, the case for expanding gas use is relatively straightforward, especially when it can substitute for oil.

The report said the competitive landscape remained "formidable", not just due to coal but also because of renewables, which in some countries become a cheaper form of new power generation than gas by the mid-2020s, pushing gas-fired plants towards a balancing rather than a baseload role," said IEA.

"Efficiency policies also play a part in constraining gas use: while the electricity generated from gas grows by more than half to 2040, related gas use rises by only

one-third, due to more reliance on highly efficient plants," it added.

As such, natural gas can play an extremely positive role in improving urban air quality and reducing air pollution.

Supplies

According to the IEA Outlook, the US will produce plentiful supplies of natural gas maintain a strong share of gas-fired power in electricity generation through to 2040, even without national policies limiting the use of coal.

"But 80 percent of the projected growth in gas demand takes place in developing economies, led by China, India and other countries in Asia, where much of the gas needs to be imported (and so transportation costs are significant) and infrastructure is often not yet in place.

"This reflects the fact that gas looks a good fit for policy priorities in this region, generating heat, power and mobility with fewer carbon-dioxide (CO2) and pollutant emissions than other fossil fuels, helping to address widespread concerns over air quality," it said.



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The IEA explained that in 2040, it would take around 10 days for major importing regions to raise their import levels by 10 percent, a week less than it might take today in Europe, Japan and South Korea.

The shale revolution in the US is quickly turning to exports, showing a remarkable ability to unlock new resources cost effectively. Shale has pushed combined US oil and gas output to a level 50 percent higher than any other country has ever managed.

“Already a net exporter of gas, the US becomes a net exporter of oil in the late 2020s. In our projections, the 8 million barrels per day rise in US tight oil output from 2010 to 2025 would match the highest sustained period of oil output growth by a single country in the history of oil markets,” the IEA stated.

US position

The report forecasts that by the mid-2020s, the US becomes the world’s largest LNG exporter and a few years later a net exporter of oil - still a major importer of heavier crudes that suit the configuration of its refineries, but a larger exporter of light crude and refined products.

The IEA also noted that “when China changes, everything changes” and that the Asian nation was entering a new phase in its development, with the emphasis in energy policy now firmly on electricity, natural gas and cleaner, high-efficiency and digital technologies.

Chinese President’s Xi Jinping has called for an “energy revolution” in the “fight against pollution” and the transition towards a more services-based economic model is moving the energy sector in a new direction.

“China’s choices will play a huge role in determining global trends, and could spark a faster clean energy transition,” said the IEA.

“The scale of China’s clean energy deployment, technology exports and outward investment makes it a key determinant of momentum behind the low-carbon transition.

“China provides a quarter of the projected rise in global gas demand and its projected imports of 280 billion cubic metres in 2040 are second only to those of the European Union, making China a lynchpin of global gas trade,” the IEA said.

Homework

The report stated that while natural gas can help the clean energy transition, the

industry still had homework to do.

“As oil and coal fall back and renewables ramp up strongly, natural gas becomes the largest single fuel in the global mix in the Sustainable Development Scenario,” said the IEA.

“Securing clear climate benefits from gas use depends on credible action to minimize leaks of methane - a potent greenhouse gas - to the atmosphere.

“Consumption of natural gas rises by nearly 20 percent to 2030 in the Sustainable Development Scenario and remains broadly at this level to 2040,” it said.

“The contribution of gas varies widely across regions, between sectors and over time in this scenario,” said the IEA in its alternative forecasting

The IEA also examined the role of methane emissions in the natural gas value chain - as the natural gas industry continues to further its efforts to mitigate methane emissions.

Action

It said that stepping up action to tackle methane leaks along the oil and gas value chain is “essential to bolster the environmental case” for gas.

“These emissions are not the only anthropogenic emissions of methane, but they are likely to be among the cheapest to abate,” said the IEA.

“We present the first global analysis of the costs of abating the estimated 76 million tonnes of methane emitted worldwide each year in oil and gas operations, which suggest that 40-50 percent of these emissions can be mitigated at no net cost, because the value of the captured methane could cover the abatement measures.

“Implementing these measures in the New Policies Scenario would have the same impact on reducing the average global surface temperature rise as shutting all existing coal-fired power plants in China,” said the IEA.

The International Gas Union (IGU) welcomed the Outlook from the IEA with its fuel focus on natural gas.

According to the IGU, the Outlook suggested that the prospects for natural

Already a net exporter of gas, the US becomes a net exporter of oil in the late 2020s.

gas “will be determined by how it is assessed by policy-makers and prospective consumers against three criteria: is it affordable, is it secure, and is it clean?” The IGU argues strongly that the response to all three questions is an emphatic “yes”.

Growth

Global gas consumption is set to grow at an average rate of 1.6 percent per year to 2040 - a higher growth projection than oil or coal - and is expected to account for a quarter of global energy demand by the same date.

“These growth projections highlight the critical importance of gas in the global energy mix - both as a sustainable and affordable option, and as an option that complements the rising use of renewable energies,” the report said.

The IGU commended the IEA for recognising the enormous versatility benefit of gas and strongly agrees with the IEA’s comments that “it can play multiple roles across the energy system in a way that no other fuel or technology can match” in terms of generating power, heat and mobility with fewer carbon-dioxide and pollutant emissions than other fossil fuels.

“This year’s IEA Outlook is extremely positive for the natural gas industry - highlighting the absolutely essential role we have to play in the global energy mix delivering an affordable, versatile and sustainable fuel,” said David Carroll, President of the IGU.

“In addition, the IGU fully supports urgent and increased efforts towards climate change mitigation. We strongly believe natural gas is perfectly positioned to make a significant positive impact to air quality, while reducing carbon emissions,” added Carroll. ■

Australia's Wheatstone project joined by Yamal and Cove Point plants for early 2018 ramp-up

Three latest liquefaction plants were developed to cope with widely differing climatic conditions

Australia's Wheatstone LNG has been joined by Yamal LNG in Arctic Russia and the Cove Point project on Chesapeake Bay in Maryland in early 2018 ramp-up operations after coming on stream at year-end.

The three liquefaction plants were developed in widely differing climatic areas of the world – Wheatstone in the red-earth, mineral area of the Pilbara region of Western Australia, Yamal on the edge of the Arctic Circle in northeast Siberia and Cove Point on the US Atlantic Coast.

Costs

The Australian, Russian and US liquefaction plants cost a combined \$60 billion to complete and will produce the cleanest hydrocarbon energy currently available for the next 40 years.

The Cove Point LNG plant in Maryland, owned by Dominion Energy, is the second US exporter to come on stream to match Cheniere Energy's Sabine Pass plant in Louisiana.

When commissioning is completed Dominion's flow of LNG would be opened up for its Asian customers who have 20-year contracts.

The contract holders for the new US LNG plant are the Japanese companies Sumitomo Corp. and Tokyo Gas, as well as Gas Authority of India.

million tonnes per annum of LNG after ramp-up.

Shell gas

Utility company Dominion, based in Richmond, Virginia, said Royal Dutch Shell's US subsidiary, Shell North America, is providing the natural gas needed for liquefaction during the commissioning process and would off-take the LNG that is produced.

"Construction of the liquefaction facility began in October 2014, following more than three years of federal, state and local permit reviews and approvals," said Dominion.

"With a cost of \$4 billion, it is the largest construction project ever thus far for Maryland and for Dominion Energy.

"Construction has involved more than 10,000 craft workers and a payroll of more than \$565 million," the company added.

The US subsidiary of IHI International Corp. of Japan and Kiewit Corp. of Omaha, Nebraska, are the engineering, procurement and construction contractors for the liquefaction facilities.

Pipelines

Additionally, the \$5-billion Atlantic Coast Pipeline project and other operating pipelines will enable the delivery of feed-gas from the Marcellus Shale to LNG export plants in Maryland, Georgia and further south as well as to pipeline consumers.

Cove Point is relatively small in size compared with other projects.

Several of the next wave of plants will be more than three-times larger in volume production, as is the case with Sempra Energy's Cameron LNG in Louisiana and the Freeport plant on Quintana Island in Texas.

The feed-gas volumes for Cove Point are expected to raise capacity on both the Loudoun and Pleasant Valley interconnects with the Columbia Gas Transmission and Transcontinental Gas Pipeline.

Combined with the 18 MTPA now being produced at Sabine Pass, the



Cove Point is on the US Atlantic Coast with shale-gas links

US now has net export capacity of 23.25 MTPA.

Overshadowed

Just before the first cargo was to be shipped, the event was overshadowed by Dominion's confirmation of a deal to buy troubled US energy company Scana Corp. in an all-stock transaction valued at about \$14.6bln.

Under the terms of the agreement, each Scana shareholder will receive roughly two-thirds of a Dominion share, or about \$53.71 per share based on Dominion's closing price on January 2 and amounting to \$7.9Bln.

The Dominion price would represent a 28 premium from Scana's closing price and the transaction will help the acquired company absorb some of the costs of a failed South Carolina nuclear project.

"Including assumption of debt, the value of the transaction is approximately \$14.6Bln," Dominion said.

Novatek success

Russian project developer Novatek exported its first cargo in December 2017 from its plant on the Yamal Peninsula.

The first Train has a nameplate capacity of 5.5 MTPA and two others are being built and a fourth is planned.

"The commencement of LNG production begins a new chapter in our corporate history," said Novatek Chairman Leonid Mikhelson.

"Many contractors and suppliers from Russia and abroad were involved in this project. We have received great support

from the Russian government in implementing it," he added.

Yamal LNG is located above the polar circle in the estuary of the Ob River, a wild, remote region that is frozen for seven-to-nine months a year and where winter temperatures can drop as low as minus-50°C.

To ensure its stability in the permafrost, the LNG plant was built on 80,000 piles of varying shapes and sizes - a solution never used on such a large scale before the Yamal project.

Launched in late 2013, Yamal LNG is one of the largest and most complex LNG projects in the world.

However, it is also one of the most competitive, as it leverages the immense onshore gas resources of Russia's Yamal Peninsula.

With its partners Total, China National Petroleum Corp and the Chinese equity firm, the Silk Road Fund, Novatek is helping develop the huge South Tambej gas and condensate field.

The project is using natural gas reserves totaling more than 4 billion barrels of oil equivalent.

To do so, more than 200 wells have been drilled to feed the liquefaction plant.

The 16.5 MTPA from the Yamal facility will be transported from the port of Sabetta, with all LNG production sold to customers in Europe and Asia under 15-year to 20-year contract

Australia also continued on its path to overtake Qatar as the world's largest LNG exporter as it built up production at the US\$34-billion Wheatstone plant, operated

With a cost of \$4 billion, it is the largest construction project ever thus far for Maryland and for Dominion Energy

Cove Point, which had been an import terminal since 2003, added on its liquefaction capability to produce 5.25

by US major Chevron, after the first cargo was delivered to Japan in November 2017.

“Wheatstone is a legacy asset that will be an important contributor to the

Australian economy for the next 40 years, providing significant economic, social and community benefits,” said the US company.

“Wheatstone, along with the Gorgon

(Chevron operated) Project, forms part of a new generation of facilities positioning Australia as a leading and reliable supplier of affordable natural gas to the

world,” it added. Chevron held a ceremony at the plant in December, exactly six years after the first ground-breaking at the site.

“Thousands of people have worked together to safely deliver Wheatstone, both in Australia and across the globe,” said Chevron.

Outgoing Chevron Chief Executive John Watson said the event marked “our success in bringing Australia one step closer to becoming the leading global LNG producer”.

Watson will be succeeded in February as head of the San Ramon, California-based company by Michael K Wirth.

Wheatstone is now a key Australian LNG export plant and a domestic gas hub enabling future development of the vast natural gas resources offshore Western Australia.

“At full capacity, Wheatstone’s two Train LNG facility is expected to contribute around 6 percent of the Asia Pacific region’s total future LNG production, delivering 8.9 million tonnes per annum,” the company noted.

The project’s domestic gas plant also has the capacity to produce 200 terajoules per day of domestic gas for the Western Australian market.

Chevron owns 64 percent of the joint venture development, while Kuwait Foreign Petroleum Exploration Co. and Australia’s Woodside Petroleum each have 13 percent.

Smaller stakes are held by the Japanese utility Kyushu Electric Power and joint venture company Jera Co Inc., representing Tokyo Electric Power and Chubu Electric.

Chevron holds an 80.2 percent interest in the offshore licenses containing the Wheatstone and Iago gas fields. ■



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For the Record

AGL ENERGY of Australia said it was seeking liquefied natural gas supply proposals for its import terminal project in the southeast Australian state of Victoria. AGL has chosen Crib Point at Western Port in Victoria as the preferred site for the nation's first LNG regasification and import jetty with an affiliated pipeline. The company said it had issued a Request for Proposal from LNG suppliers after receiving multiple expressions of interest. Australia has huge reserves of natural gas that it exports from the states of Western Australia and Queensland and is on track to become the largest LNG exporter, overtaking Qatar by 2019. However, the East Coast natural gas market, including parts of Queensland, South Australia, New South Wales and Victoria has become a political issue in the country because of rising prices and warnings of future shortages.

"Discussions with gas consumers, including large manufacturing companies in Victoria and New South Wales have confirmed demand for the gas AGL proposes bringing in," said AGL in a statement on its LNG project. "The most effective way to put downward pressure on prices is to increase supply and that is what AGL is proposing," it added. The final LNG requirement from AGL is expected to be for around 1 million tonnes per annum of LNG. AGL chose Crib Point for what would be Australia's first LNG regas terminal as it is close to the largest gas market in terms of domestic volumes. The company is continuing to engage with the relevant authorities and the Western Port community to complete studies on the proposed site. AGL said it would invest around \$250 million on the terminal and expected to commence commercial operations by around 2020-2021.

Australia has also started a feasibility study to examine the potential of a West-East natural gas pipeline to supply eastern and southern markets with Western Australia's abundant supplies as an alternative to domestic LNG shipments. The study is due to be published in March 2018. The pipeline project from Western Australia's Pilbara region to the East and Southeast states

has won the backing of many in the industry. One outline plan is for a pipeline to be laid from the northwest of Western Australia along a 1,500 kilometres route to link with existing processing and storage facilities at the town of Moomba, about 770 kilometres north of Adelaide in South Australia.

AIR PRODUCTS, the leading LNG liquefaction technology company, said it had extended the employment contract of its Chairman, President and Chief Executive Seifi Ghasemi through September 2022. Iranian-born Ghasemi, aged 72, was named to his posts in 2014 and has led the company through a transformation over the past three years. In the restructuring, he has spun-off and sold subsidiaries to concentrate on the core business of industrial gases. One of the main pieces of equipment made by Air Products are heat exchanger units produced at its Florida manufacturing facility and supplied to liquefaction plants in the US and around the world.

"Seifi is an extraordinary leader and strategist who has built strong relationships with customers, investors and employees based on his track record of consistently delivering on commitments," said Air Products board member Chad Deaton. "The board is taking this action now to assure Air Products' stakeholders that the company will have strong and stable leadership to continue the transformation that has been underway and deploy the company's significant investment capacity arising from its recent divestitures and strong cash flow," added Deaton. Ghasemi said it had been an honour to lead Air Products over the past three years. "I am excited about the opportunity to continue to work with this great team to secure Air Products' place as the safest, most diverse and most profitable industrial gas company in the world," stated the CEO. Ghasemi was born in the Iranian city of Mashhad and first came to the US as a graduate student at Stanford University, where he received his master's degree in mechanical engineering and worked in the steel industry in Iran. He later fled from Iran with his family in 1978 when Islamic revolutionaries overthrew the Shah and he eventually settled in the US.

Ghasemi worked with Airco, a company which was taken over by industrial gases group BOC, where he became President of BOC's Americas unit. He then moved to British aerospace and auto parts maker GKN before joining

private equity firm Kohlberg Kravis Roberts & Co. in 2001 to build its Rockwood Holdings unit into a multinational chemicals company. Ghasemi was invited to join the Air Products board in 2013 and in 2014 he became CEO. Ghasemi accompanied the recent US trade mission to China led by President Donald Trump and Air Products signed an investment cooperation agreement with Yankuang Group for a \$3.5 billion coal-to-syngas production facility in China. The facility will be built in Yulin City in China's Shaanxi Province. In its latest earnings, the Lehigh Valley, Pennsylvania-based Air Products posted rising profits for the fourth quarter of its fiscal year that ended in September. Sales for the quarter amounted to \$2.2 billion, a rise of 13 percent, and quarterly net income from continuing operations was \$387 million, an increase of 19 percent on the same three months of 2016.

ANADARKO Petroleum Corp., one of the main participants in projects to develop liquefied natural gas production in Mozambique, is setting aside \$150 million for spending on initial development of the onshore liquefaction plant planned for the southeast African nation. The onshore liquefaction plant will be constructed near the port of Pemba in the northeast Cabo Delgado Province. "Approximately \$150 million is expected to be invested during 2018 as the company advances the Mozambique LNG project," Anadarko said in a statement about its spending plans. "This investment will primarily be used to fund Anadarko's portion of the costs associated with preparing the site of the future LNG park," the US company said.

Anadarko added that it also plans to allocate the same amount towards its international cash-generating operations in Algeria and Ghana in 2018. "These investments will support further drilling in Ghana's Tweneboa, Enyenra and Ntomme (TEN) area, which is expected to commence in early 2018, as well as additional drilling operations in the Jubilee field following the Ghanaian Government's recent approval of the full-field plan of development," said Anadarko. Separately the company's exploration investments in 2018 are expected to total about \$200M. Exploration spending will primarily be focused on the Gulf of Mexico, where the company plans to drill identified prospects near existing operated infrastructure. "Additional

exploration investment will be allocated to the US onshore, as the company continues to identify future areas that can make a material and scalable addition to its portfolio," said Anadarko. In its most recent earnings, Anadarko posted a net loss attributed to one-off items of \$699M in the three months to the end of September, less than the \$830M loss posted in the same quarter in 2016.

The US company is the operator of the Area 1 licence in the prolific Rovuma Basin offshore Mozambique where its onshore joint venture is planned and where Italy's Eni is leading a floating production project called South Coral FLNG. "Our 2018 investment plan will again be driven by capital efficiency and financial discipline," said Anadarko Chairman, President and Chief Executive Al Walker. "These key tenets have served us well for the last decade, as growth within cash flow is fundamental to delivering capital-efficient returns," he added. Anadarko has a 26.5 percent stake in Mozambique Area 1 and Japanese trading house Mitsui holds 20 percent. Indian companies, including Bharat Petro Resources, ONGC Videsh and Oil India Ltd., hold a further 30 percent. The Mozambican state energy company ENH has 15 percent of the licence and Thailand's PTT Exploration & Production has an 8.5 percent shareholding. Anadarko's US operations are centred on the Delaware Basin of West Texas and southern New Mexico, the DJ Basin in Colorado and in the deepwater Gulf of Mexico.

AUSTRALIA is heading into 2018 with a revived oil and gas industry with production at record levels, including LNG output and revenue as well as domestic gas supplies. LNG production in the third quarter of 2017 increased by 20.5 percent versus the previous three months to a record 14.6 million tonnes, according to a report from Australian-based consultants EnergyQuest. "We estimate LNG export revenue for 2017 will be around \$25.5 billion, up 42.5 percent from 2016," said the report. "Domestic gas production also set records, despite the reality of tight supply on the East Coast, where domestic gas production was the highest in three years. WA production for the domestic market increased by 6.0 percent on the previous quarter to 101.2 petajoules," it added.

The report noted that the East Coast gas market is tight but production is catching up with demand. Gas flowed

south from Queensland in the third quarter for the first time since all six LNG Trains were commissioned at the three coal-seam-gas-to-LNG plants, Australia Pacific LNG led by ConocoPhillips, the Shell-owned Queensland Curtis plant and the Gladstone facility operated by Australia's Santos. "Growth in East Coast gas production outpaced the growth in LNG exports in Q2 and Q3 2017 by around 15 PJ in each quarter," said EnergyQuest. Use of gas for power generation increased by 39 percent, rising in all National Electricity Market states except Queensland. "With plenty of wind and more gas-fired generation South Australia was a net exporter of electricity to Victoria," it added. "The announcement of sale of a majority of Arrow Energy's Surat Basin gas reserves to QCLNG is positive for east coast gas supply," the report said. The consultants said East Coast contract gas prices continued to rise in the third quarter.

The new Australian Bureau of Statistics index of wholesale gas prices received by producers showed an increase of 44.2 percent for eastern states but a fall in Western Australia prices of 8.3 percent. "Santos convinced analysts of its turnaround story and outlined comprehensive plans for a return to growth in the medium to long term. It was so convincing that it attracted a take-over bid from Harbour Energy," said the report, referring to a previous offer by a US equity fund-backed firm. Australian exploration activity was also seen picking up strongly with investors supporting the petroleum sector in capital-raising transactions and initial public offerings. EnergyQuest said that according to its data Royal Dutch Shell was the largest petroleum producer on both an annual and quarterly basis at the end of the third quarter, accounting for one in every six barrels of oil equivalent of national production, up from only one in every 18 boe in the third quarter of 2015.

AWE, the Australian Energy company, a substantial stakeholder in the largest onshore natural gas discovery in Western Australia for 40 years, was awaiting the next moves following a US\$325 million takeover offer from a state-owned energy company in China. China Energy Reserve and Chemical Group (CERCG) made an unsolicited, non-binding conditional proposal at A\$0.71 per share for the Australia exploration and production market player and holder of a 50 percent

stake in the Waitsia natural gas field in the Perth Basin of Western Australia. The Chinese company's offer is at a more than 30 percent premium on AWE's last closing price of A\$0.54 cents a share. AWE's board has not rejected the offer, though said it was "not sufficiently attractive" to provide the Chinese with access to its books. "AWE understands that CERCG is a Chinese state-owned entity with operations in oil and gas trading, logistics, distribution and supply services located in China," the Australian company said in its statement.

The Chinese proposal is subject to a number of conditions, including completion of satisfactory due diligence and approval of any final deal by its own board and Australian regulators. "AWE will keep the market informed of any material developments in relation to the Indicative Proposal in accordance with its continuous disclosure requirements," the company said. "AWE shareholders do not need to take any action in response to the Indicative Proposal at this stage," it added. AWE's most valuable asset is its 50-percent joint venture stake in the Waitsia field. The other shareholder is Beach Energy of Australia. The field was discovered in September 2014 and its stage-two development is currently being planned. It would supply the domestic market, leaving other companies with even more gas to ship overseas as LNG exports. AWE also recently upgraded field resource estimates for the Waitsia field by 78 percent after an independent review.

AWE said in November that an independent review of the field gave estimates of gross proven reserves and probable reserves (known as 2P) of 811 petajoules. The company said the increase reflected the significantly better-than-expected reservoir quality, thickness and well deliverability during recent drilling and testing. The Waitsia Stage 2 development project is planned to deliver 100 terajoules per day for at least 10 years. AWE added that "substantial additional upside is demonstrated" by the new gross proven, probable and possible (3P) reserve estimate of 1,220 petajoules. The review and evaluation were carried out by RISC, an independent oil and gas consultancy firm with offices in Australia, Asia, the Middle East and the UK.

BEACH ENERGY, the emerging market player in Australia, said it signed an agreement to acquire equity in two North West Shelf exploration permits in the Carnarvon Basin offshore Western

Australia with LNG production prospects. The two permits, known as WA-359-P and WA-409-P, are being purchased from Australia's Cue Energy Resources and subject to exercise of an option BP of the UK will participate with majority stakes in both permits. "The farm-in agreement for WA-359-P and call option for WA-409-P give Beach exposure to a potentially significant gas-condensate discovery which may extend across both permits," said Beach. The permits adjoin the giant Ironbark gas-condensate prospect offshore Western Australia. "Exploration success at Ironbark could provide significant, long-term gas volumes to feed nearby LNG plants in the coming decade," said Beach.

"Ironbark is located less than 50 kilometres from the North West Shelf LNG's Rankin platform, and is in close proximity to Pluto and Wheatstone LNG infrastructure," said the Australian company. The name Ironbark is also given to separate Australian onshore coal-seam gas project in Queensland. Beach earlier in 2017 agreed to buy Origin Energy's conventional oil and gas business, Lattice Energy, for US\$1.25 billion, a deal that tripled the Adelaide-based company's Australian reserves. The company said the Lattice purchase established it as a major supplier of gas to domestic markets and provided a step-change in production and operating capabilities. "For some time, Beach has been seeking high impact exploration opportunities in Australia and New Zealand to add to its growth portfolio," said Beach Chief Executive Matt Kay.

"We have taken a disciplined approach and the Ironbark prospect is an exciting, high impact exploration prospect. With favourable Western Australia LNG market dynamics over the coming decade, successful development of Ironbark may align with expected shortfalls in LNG feedstock," added Kay. "Beach is also excited to collaborate with high-quality joint venture partners in BP and Cue," he stated. Beach will acquire a 21 percent equity interest in WA-359-P in exchange for a one-off payment to Cue of \$900,000 for past costs, and future payments equating to 4 percent of Cue's cost of drilling the Ironbark-1 exploration well within the permit. The Ironbark prospect is interpreted to have reservoirs of similar age to nearby giant fields such as Gorgon and Goodwyn. BP exercised its option to acquire a majority equity interest in WA-359-P and the UK company has until 11 December 2017 to complete the

transaction, unless the option itself is extended.

CANADA has shipped its first LNG cargo to China in an ISO container as part of a pilot project for small-scale cargoes from the Tilbury liquefaction plant in the Pacific Coast province of British Columbia, owned by power company FortisBC. "This pilot is a small but significant step for BC's LNG export industry," said Douglas Stout, Vice-President of Market Development at the utility. The FortisBC plant is a small-scale facility in the town of Delta on the Fraser River, about 30 kilometres from Vancouver. The company also owns a second small plant originally built for peak-shaving activities. "We are working toward changing the LNG landscape with the first of what could be many shipments from our province," said Stout. The delivery on a cargo ship from the Port of Vancouver is expected to arrive in China at the start of December, though the end-user has not yet been disclosed. The LNG shipment to China comes after the province of BC has seen more than a dozen large-scale production projects cancelled because of the combination of the oil-price slump and anti-hydrocarbon industry policies brought in by the federal government in Ottawa of Prime Minister Justin Trudeau.

Among the ventures suspended were the Pacific Northwest LNG project led by Malaysian energy company Petronas near the port of Prince Rupert and the LNG Canada venture backed by Royal Dutch Shell and initially proposed for a brownfield site near the town of Kitimat. FortisBC's LNG production facilities at Tilbury have been in operation since 1971 and it also has the Mt. Hayes facility near Ladysmith on Vancouver Island, operating since 2011. Both facilities are strategically located near ports, water channels and the Pacific Ocean, and are the only operating LNG production facilities on the West Coast of North America. Even with an expansion completed in September 2017, the Tilbury plant still has less than 500,000 tonnes per annum of output. Since 1995, LNG from Tilbury has been used as an energy source for remote communities in the province and neighbouring provinces and territories. In 2009, FortisBC identified an opportunity to support the BC transportation sector in adopting natural gas as a fuel for trucking as an alternative to diesel and with lower greenhouse-gas emissions. For the ISO

container shipment to China, FortisBC said the logistics and equipment were provided by True North Energy Corp. and Chinese container company CIMC ENRIC Holdings.

“True North Energy is pleased to work with FortisBC, a clean energy leader, and CIMC ENRIC, a global leading LNG equipment provider and active advocate of innovative LNG logistic solutions, to make the first ever LNG export to Asia from Canada,” said Calvin Xu, Chief Executive of True North Energy. “LNG is a much cleaner alternative fuel than coal and diesel,” added Xu. “By working with FortisBC and CIMC ENRIC, we will continue to develop a strong LNG market in Canada and abroad,” the CEO said. The three companies noted that by 2018, China was forecast to become the world’s second-largest LNG importer after Japan, overtaking South Korea. “The Chinese government is stepping up its efforts in combatting air pollution and LNG imports have more than tripled in the last six years,” said FortisBC. The company also noted that China was in the process of converting millions of homes to natural gas heaters this winter and increasing the industrial use of gas. “Our Government is pleased to see this pilot project launch its first shipment of LNG to China,” said Michelle Mungall, BC regional Minister of Energy, Mines and Petroleum Resources.

CHENIERE Energy, owner of the Sabine Pass plant in Louisiana and developer of the Corpus Christi facility in Texas, reported a third-quarter net loss even as revenues from LNG for the first nine months of the year reached \$3.85 billion. Cheniere

posted a wider net loss of \$289M in the quarter compared with a \$101M loss in the prior-year quarter. The Houston-based company also posted a loss of

\$520M for the nine months to the end of September versus a net loss of \$720M for the same period of 2016. Cheniere said the wider quarterly net loss was because

of increased expenses, including interest payments and derivative losses, partially offset by rising income from operations.

During the three and nine months

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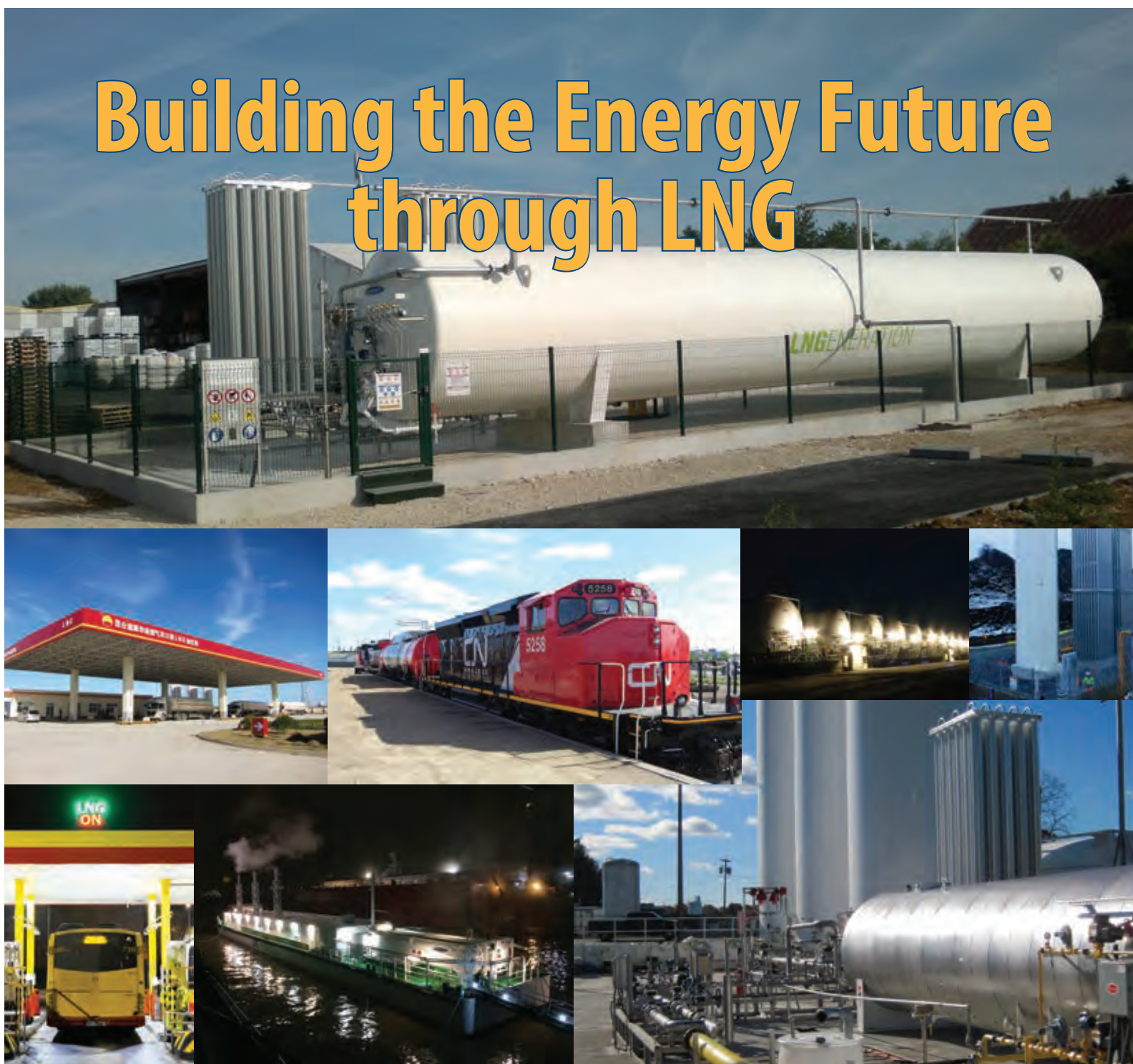


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periods Sabine Pass sent out 44 and 135 LNG cargoes respectively. Cheniere has shipped more than 200 from the Sabine plant since February 2016 and supplied 25 different countries worldwide. Revenues amounted to \$1.40 billion for the three months and 3.85Bln for the first nine months of 2017, versus \$465M and \$711M for the same periods of 2016 when there were fewer processing Trains than the four now operating. The four Trains at the Louisiana facility have a nameplate capacity of 18 million tonnes per annum. The Sabine Pass Train 4 became operational in October 2017, Train 5 is under construction and Train 6 is being commercialized and has all necessary regulatory approvals in place. Cheniere said consolidated adjusted gross earnings for the three-month and nine-month periods amounted to \$442M and \$1.3Bln compared with \$67M and \$19M for the comparable 2016 periods. “I’m pleased to report our strong third-quarter results, which are a product of continued execution and operational excellence across the company,” said Jack Fusco, President and Chief Executive. “The third quarter was highlighted by the commencement of our long-term contract with Gas Natural Fenosa (Spain) and the successful commissioning of Train 4 at Sabine Pass,” noted Fusco. “We are revising our 2017 guidance upward as operating results continue to exceed earlier expectations, and we have greater certainty on results as we approach the end of the year,” the CEO added.

The Houston-based company also recently opened offices in Tokyo and Beijing and established an in-country presence in Thailand to build expertise and local relationships. Cheniere is also developing a second natural gas liquefaction and export facility at the Corpus Christi LNG terminal, which is on nearly 2,000 acres of land at the Texas port with an associated pipeline venture. “We are focused on advancing long-term LNG Sale and Purchase Agreement discussions to facilitate the Final Investment Decision of Train 3 at the Corpus Christi Liquefaction Project, and have commenced advanced engineering and preliminary procurement work on Train 3 with our EPC partner Bechtel,” said Cheniere. Corpus Christi is being developed for up to three Trains with 13.5 MTPA of output and three LNG storage tanks with aggregate capacity of 10.1 billion cubic feet equivalent and two marine berths for the largest carriers. The project also includes a 23-mile natural

gas supply pipeline that will interconnect the Corpus Christi plant with several interstate and intrastate natural gas pipelines. Cheniere added that in the expansion plans for Corpus Christi, front-end engineering and design was completed on a “midscale liquefaction solution” and the company also began the process of amending its filing with the Federal Energy Regulatory Commission to incorporate the new liquefaction technology.

CHEVRON CORP. and its joint venture partners in the US\$34-billion Wheatstone LNG project in Western Australia have held a ceremony at the completed plant near Onslow to celebrate its success. Chevron Chairman and Chief Executive John Watson was joined at the Wheatstone plant by Western Australian Premier Mark McGowan and other officials and community leaders and Chevron management. Speaking at the event exactly six years since the first ground-breaking at the Wheatstone plant site, Chevron Australia Managing Director Nigel Hearne congratulated the thousands of people who contributed to the safe delivery of the first LNG cargo to Tokyo Bay on November 10. “Thousands of people have worked together to safely deliver Wheatstone, both in Australia and across the globe,” said Hearne.

“Wheatstone is a legacy asset that will be an important contributor to the Australian economy for the next 40 years, providing significant economic, social and community benefits. Wheatstone, along with the Gorgon Project, forms part of a new generation of facilities positioning Australia as a leading and reliable supplier of affordable natural gas to the world,” said Hearne. Outgoing Chevron CEO Watson said the event marked “our success in bringing Australia one step closer to becoming the leading global LNG producer”. Watson will be succeeded in February 2018 as head of the San Ramon, California-based company by Michael K Wirth. Chevron said Wheatstone also represented the development of a major new source of reliable domestic gas to Western Australia, with the capacity to produce 200 terajoules per day for the local market.

Wheatstone is now a key Australian LNG export plant and a domestic gas hub enabling future development of the vast natural gas resources offshore Western Australia. “At full capacity, Wheatstone’s two Train LNG facility is expected to

contribute around 6 percent of the Asia Pacific region’s total future LNG production, delivering 8.9 million tonnes per annum,” the company noted. The project’s domestic gas plant also has the capacity to produce 200 terajoules per day of domestic gas for the Western Australian market. Chevron owns 64 percent of the joint venture development, while Kuwait Foreign Petroleum Exploration Co. and Australia’s Woodside Petroleum each have 13 percent. Smaller stakes are held by the Japanese utility Kyushu Electric Power and joint venture company Jera Co Inc., representing Tokyo Electric Power and Chubu Electric. Chevron holds an 80.2 percent interest in the offshore licenses containing the Wheatstone and Iago gas fields.

CLEAN ENERGY Fuels Corp., the California-based leader in gas-fuel supply including liquefied natural gas, was awarded a four-year contract for the heavy-duty trucks operating for the largest Toyota Motor plant in North America. The contract was signed with Ryder System Inc., the commercial fleet manager and transport provider for the Toyota Motor Manufacturing factory in Georgetown in the state of Kentucky. Clean Energy will open an LNG filling station in Georgetown to fuel the trucks that are expected to consume around 380,000 gasoline gallon equivalents (GGEs) each year. Ryder has made LNG and clean fuel use a priority and is one of the main customers of Clean Energy.

Toyota in the US said it had also moved towards using alternative fuels to diesel and has encouraged its third-party carriers to use LNG to produce fewer emissions for logistics transportation. “We are seeing a trend in shippers selecting carriers that demonstrate a commitment to the environment,” said Chad Lindholm, Vice President at Clean Energy. “Natural gas is a perfect fit for carriers because not only is it cleaner, it’s abundant, is available today, performs every bit as well as diesel and makes sense economically.” added Lindholm. Clean Energy, based in Newport Beach, is the leading provider of natural gas fuel for transportation in North America and has a network of stations already completed from southern California to the Canadian border.

The US company now has around 550 fuel stations across the country as it continues with its LNG and compressed natural gas fuel distribution growth. During the third quarter, Clean Energy delivered 91.5 million gallons, an 8.3

percent increase from 84.5M gallons delivered in the same period in 2016. For the nine months, the Newport Beach-based company delivered 265.0M gallons, an 8.2 percent increase from 244.9M gallons in the same period in 2016. The company’s main station network covers routes along the West Coast of America from southern California to Oregon on the Canadian border. Revenue for the third quarter was \$81.8M, a 15.7 percent fall from the \$97.0M of revenue logged in the year-ago quarter, Clean Energy also closed 42 “underperforming and unprofitable stations” as a way of reducing annual expenses by around \$15M.

DELEK GROUP, the Israeli company focusing on the energy sector, said it expected to sell natural gas to Egypt in the future from its Tamar and Leviathan gas field projects in the East Mediterranean as Egyptian needs outstrip its supplies. “With regard to the possibility of exporting natural gas from Israel to Egypt, the Group reiterated that there was no change in its assessments regarding the possibilities of gas exports, and that the negotiations between the parties continue with the aim of signing significant long-term export agreements,” said Delek. The Leviathan field has around 22 trillion cubic feet of reserves and the Tamar field has 11.25 Tcf of reserves in place. Delek cited a consultancy report on demand and supply forecasts for Egypt over the next few years, saying that Egypt’s natural gas demand is expected to exceed its domestic supply. Egypt is currently bringing on stream the Zohr field discovered in the East Med in the Shorouk concession and approximately 120 miles north of Port Said in water depths of 4,900 feet.

Italian energy company ENI is the licence holder and is preparing the final stages of the Zhor field development. The Egyptian field has estimated total resources at 30 Tcf and could end the nation’s natural gas shortages that turned it from an LNG exporter into an LNG importer.

However, Delek is still optimistic about being a future supplier to Egypt with its main partner in the Leviathan and Tamar projects, the US company Noble Energy. “Even if the Zohr reservoir is fully developed in accordance with the original timetables set for it, a shortage of natural gas is expected in Egypt over the coming years, which supports the partnership’s existing assessments that Egypt continues to be a major target for the

export of gas from the Tamar and Leviathan projects,” said Delek. Delek made its statement on natural gas sales to Egypt in its third-quarter earnings. The whole group posted net profits in the third quarter of more than 1 billion Israeli shekels (\$285M) compared with 85 million shekels (\$24.2M) in the same quarter a year ago.

Delek said its oil and gas exploration continues to make a significant contribution to the group's earnings. In its energy highlights, the company noted its sale of 9.25 percent of the holdings of the Delek Drilling subsidiary in the Tamar field to the Tamar Petroleum spin-off, resulting in a net profit of 873M shekels (\$249M). “The sale of the rights was made in accordance with the gas outline, in which the partnership undertook to sell all its holdings in Tamar by the end of 2021,” it added. After the sale of the rights, about 22 percent of the rights in the Tamar reservoir will remain in Delek's hands. “We concluded the third quarter with record profits of over 1 billion shekels, in line with our strategy to focus on energy and at the same time to

expand our operations into international markets,” said Asaf Bartfeld, President and Chief Executive of Delek Group. “The Group continues to focus on its goal of becoming an international energy company. Our recent acquisition of Ithaca (in Canada) is an important platform for our continued consolidation in the global market and for the implementation of this goal,” added Bartfeld.

DNV GL, the European classification society, said its forecasts for the adoption of LNG as a fuel for shipping have been revised to between 400 and 600 vessels by 2020 instead of the 1,000-plus previously estimated. The class society first made its estimate in 2012 and has now issued a lower forecast because of slower sector development caused by the lower oil price that hit investment and the planned build-out of bunkering infrastructure. Its report said there were LNG-fueled ships and more than two-thirds of these are operating in Europe. “A confirmed order book of 111 vessels will see that figure double,” the report said. “In addition, there are 114 vessels that are classified

as LNG-ready. A quicker uptake of LNG as a fuel for shipping is thus clearly visible,” it stated. DNV GL suggested that the conditions needed for an acceleration of the adoption of LNG as a maritime fuel were now in place. “There are 60 supply locations worldwide, including Singapore, the Middle East, the Caribbean as well as Europe,” it said.

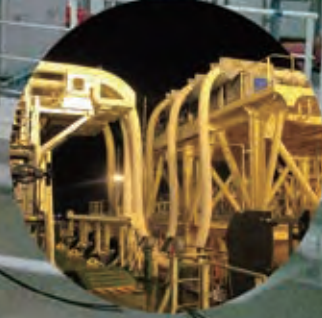
“A further 28 facilities have been decided and at least 36 are under discussion,” the report added. By the beginning of 2018, six LNG bunker vessels will be in operation globally, and four more projects are confirmed. “Major players including Total, Shell, Gas Natural Fenosa, ENN and Statoil have announced plans for new LNG bunker vessels,” the report said. The society said government-backed initiatives were also getting underway in China, South Korea and Japan, as these countries strive to meet ambitious national targets for combating local pollution and reducing greenhouse gases. “For suppliers, it's very much a question of timing,” said DNV GL's Senior Consultant for Environmental Advisory, Martin

Christian Wold. “They won't bring these facilities online until they see sufficient confirmed orders for LNG-fuelled tonnage to justify the investment. Yet, they are also jostling to secure an anchor customer and gain first-mover advantage to deter their rivals from setting up nearby,” he added.

DNV GL noted that Shell had just signed a long-term charter agreement for a 4,000 cubic metres capacity bunker barge to supply LNG bunkers along the US East Coast. “Meeting growing demand for LNG from cruise lines was cited as the major impetus behind the decision,” said DNV GL. The LNG fuel report said the regulatory outlook was now much more certain, thanks to the International Maritime Organization setting 2020 as a fixed date for the introduction of its global cap on fuel sulphur content. “Because of the political currency attached to the decision, any softening of the regulation or significant slippage is regarded as unlikely,” it said. “Evaluating whether LNG as a fuel will provide a competitive edge is difficult enough for ship owners.

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Having to anticipate various regulatory scenarios on top of that complicated matters further. The IMO's decision brings much-needed clarity to owners considering switching to LNG and other alternative fuels," explained Wold.

ENERGY WORLD Corp., the Asia-Pacific project developer, has cleared the final hurdle to bring a power plant and LNG hub venture on stream in 2018 at Pagbilao in Quezon Province of the Philippines. "With this agreement now in place we will now proceed to complete construction of the power plant and the LNG hub terminal with a view to commencing commercial operations in 2018," said Brian Allen, Executive Director of EWC. The EWC LNG terminal in Pagbilao is the first constructed in the Philippines. It has two storage tanks and total capacity of 260,000 cubic metres, supplying the affiliated gas-fired power plant. Allen signed the accord in the city of Lucena, the capital of the Quezon province, with Provincial Governor David C. Suarez and with another EWC Executive, Graham Elliott, in attendance.

"Notwithstanding that this has taken longer than expected, due to circumstances outwith our control, we are delighted to have secured this agreement and acknowledge the tremendous support of the Quezon Province Suarez in facilitating the negotiations," stated Allen. EWC's headquarters are in Hong Kong and its shares are listed on the Australian Securities Exchange. Its Asian LNG projects also include a small-scale liquefaction plant at Sengkang in Indonesia and energy and power ventures in Australia and Papua New Guinea. The EWC binding agreement in the Philippines is for land ownership and right-of-way access from its 650-magawatts Pagbilao Power Station to the nominated National Grid connection point. The ability to pursue the land accord followed the National Grid's confirmation in October 2107 of the final location of the proposed new Pagbilao high-voltage, sub-station for the project. "The right-of-way access will enable us to construct, operate and maintain a transmission line," said EWC. "We have previously obtained all required approvals for the design and construction of the transmission line," it added.

ENI, the Italian energy company which has an impressive record of huge natural gas finds in recent years that have led to LNG development in Mozambique and

Egypt soon ending its shortfall in pipeline gas, has received approval from the US for drilling offshore Alaska. The US Bureau of Safety and Environmental Enforcement (BSEE) approved the application for Eni US Operating Co. to drill an exploratory well from a man-made artificial island in the Beaufort Sea. It is the first approval for Arctic exploration operations on the Outer Continental Shelf in more than two years and drilling is scheduled to begin right away. "Responsible resource development in the Arctic is a critical component to achieving American energy dominance," said BSEE Director Scott Angelle. "BSEE is committed to working with our Alaskan Native and industry partners by taking a thoughtful and balanced approach to oil and gas exploration, development and production in the Arctic," added Angelle.

The Bureau's approval allows Eni to move forward with new exploration in federal waters after a thorough review to ensure the request met appropriate technical adequacy, safety and environmental sustainability standards. The US Arctic approval comes as Eni makes progress on its Mozambique Coral floating LNG project to tap natural gas resources in the Rovuma Basin of the Indian Ocean in the southeast African nation's Area 4 licence block. The Coral FLNG project involves the installation of a liquefaction hull offshore with capacity to produce around 3.4 million tonnes per annum of LNG, fed by six subsea wells and with an expected start-up in mid-2022. ENI is also preparing the final stages of the Zhor field development offshore Egypt in the East Mediterranean that will end the nation's natural gas shortages that turned it from an LNG exporter into an LNG importer. Eni's US drilling will take place on Spy Island, a man-made artificial island about three miles offshore Oliktok Point in State of Alaska waters.

Both the island and Oliktok point are already home to Eni facilities and the Italian company is planning to use extended-reach drilling techniques to drill into federal submerged lands.

The extended-reach drilling will target a formation in the newly formed Harrison Bay Block 6423 unit on the OCS that the BSEE approved in December 2016. Eni will explore the Harrison Bay Block in partnership with Royal Dutch Shell and plans to drill two explorations wells and two potential side-tracks over the next two years. "I am always mindful of the

need to protect the environment and our subsistence way of life and I appreciate BSEE and the Department of Interior's commitment to responsible development," said North Slope Borough onshore area Mayor Harry K. Brower, who is also a whaling captain. "The Borough and the majority of our residents have long supported the careful and responsible development of oil and gas resources within our region that protects the balance between economic development and our subsistence way of life," he added.

ENI, which in recent years has made huge natural gas discoveries offshore Egypt and Mozambique that will impact LNG markets, has entered into an exploration and production sharing agreement for Block 52 offshore Oman and has brought Qatar Petroleum in as a licence stakeholder. The licence covers an under-explored area with potential located offshore the Arabian Peninsula in the southern region of Oman. The signing ceremony took place in the capital Muscat, assigning 85 percent of the licence rights of the 90,000 square kilometres area to Eni as the operator of the block and 15 percent to state-owned Oman Oil Company Exploration and Production. During the same event, Eni and Qatar Petroleum, owner of the world's largest LNG-producing complex at Ras Laffan in Qatar, signed an agreement for the assignment of 30 percent of Eni's interest in Block 52 to the Qataris.

"We wish to establish with the Sultanate of Oman, which is a historical oil and gas producer in the region, a long-lasting relationship in the best tradition of Eni," said Chief Executive Claudio Descalzi. "It is also remarkable that, the same day, we are welcoming Qatar Petroleum as a partner in Block 52, to join our efforts with such a strong partner that is currently leading the LNG business worldwide," added the Eni CEO. Block 52 was awarded to Eni and the Oman state energy company in an international bidding round held in October 2016. The signing ceremony for the licence stakes was attended by the Eni CEO as well as the Minister of Oil and Gas of Oman, Mohammed bin Hamad Al Rumhi, Oman Oil CEO Islam Al Zadjali and Qatar Petroleum's President and CEO Saad Sherida Al-Kaabi.

LNG producer Oman is preparing to upgrade its liquefaction plant at Sur in the south to be able to process more feed-

gas under a contract awarded to US energy engineering company KBR Inc. The KBR contract coincides with a boost in Oman's natural gas resource position that will lead to a longer life span for the liquefaction and export plant. BP of the UK in September 2017 started production at the giant Khazzan tight gas field, helping the nation to overcome domestic gas shortages that had led to a re-think on the future of LNG production.

Production company Oman LNG has capacity to process additional volumes as it is currently operating at 82 percent of total capacity of 10.4 million tonnes per annum of LNG. The plant last year exported a total of 8.12 million tonnes of LNG compared with 7.56MT in the previous year. Concern over meeting rising domestic consumption prompted Oman LNG to announce in 2015 that it would have to divert all its exported volumes of natural gas away from foreign markets and toward domestic consumers unless more gas was found.

EXXONMOBIL Corp, the US major, has signed production sharing contracts with the government of Mauritania for three deepwater offshore blocks in the waters of the West African nation undertaking floating LNG projects with neighbouring Senegal. "These blocks further enhance ExxonMobil's leading global deepwater acreage position," said Steve Greenlee, President of ExxonMobil Exploration Co. "We thank the government of Mauritania for the opportunity to evaluate the potential of this acreage using our expertise and advanced technology," added Greenlee. Blocks C22, C17 and C14 are located an average of 124 miles, or 200 kilometres, offshore Mauritania. ExxonMobil said the together the blocks measure nearly 8.4 million acres in water depths ranging from 3,300 feet to 11,500 feet, or 1,000 metres to more than 3,500 metres. Following government approval of the contracts, ExxonMobil will begin exploration activities, including acquisition of seismic data and analysis. ExxonMobil will carry out the work program as operator with 90 percent interest, while the national energy company of Mauritania will hold a 10 percent stake.

BP of the UK and Dallas-based Kosmos Energy are developing two FLNG projects using feed-gas from large discoveries offshore Senegal and Mauritania. The Kosmos-BP LNG plans are for the Greater Tortue Complex where

resources are estimated at 25 trillion cubic feet of gas. The first gas from the Kosmos-BP FLNG Train 1 is scheduled for 2021 and the start of FLNG Train 2 is set for 2023. The waters of the Atlantic Margins are attracting more oil and gas exploration activities following discoveries offshore Ghana and Equatorial Guinea. Kosmos said recently it had just drilled the Hippocampe-1 exploration well located in Block C-8 offshore Mauritania in 2,600 metres of water. The Hippocampe-1 well was drilled to a total depth of 5,500 metres. Developed reservoirs were encountered in both exploration targets but these proved to be water bearing.

“The well will now be plugged and abandoned. It is believed that this prospect failed due to a lack of charge access in this part of the play fairway,” said Kosmos. Kosmos focuses on frontier and emerging areas along the Atlantic Margins and has also made oil and gas discoveries offshore Ghana. It has also recently purchased licence stakes for exploration offshore Equatorial Guinea. Andrew G. Inglis, Chairman and Chief Executive, said the drilling followed on from its Yaakar field discovery in 2017. “Hippocampe-1 is the second of four tests of independent prospects located in the outboard basin floor fan fairways in our Mauritania and Senegal acreage,” explained Inglis. “Although the well did not encounter oil or gas, it has, together with Yaakar, confirmed the presence of quality cretaceous reservoir in the outboard basin floor fans, which contain multiple leads and prospects, more than 200 kilometres from the north to south through our blocks,” added the CEO.

FERGUSON Marine Engineering has held a naming ceremony at its Port Glasgow shipyard in Scotland for the first dual-fuel ferry in the UK with liquefied

natural gas capability. The vessel was named “Glen Sannox” and is one of two environmentally-friendly vehicle and passenger ferries that will be built by

Ferguson Marine. Construction of the ferry of 102 metres in length, which can use LNG or marine oil propulsion, started in 2016 with delivery to the customer,

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Caledonian Maritime Assets Limited (CMAL), scheduled to take place around the end of 2018. The CMAL company is an offshoot of the former Caledonian MacBrayne ferry company that was previously subsidized. However, to comply with European Union guidelines on state aid in maritime transport, open public tenders were deemed necessary in respect of the ferry services.

In recognition of the uniqueness of the fleet and to ensure a level playing field for all bidders, Caledonian MacBrayne was split in 2006 into two companies, the asset-owning company, Caledonian Maritime Assets Ltd (CMAL) and a new operating company, CalMac Ferries. CMAL continues to own the vessels and land-based assets such as the ports and harbours and makes them available to operators through an open tendering process. The dual-fuel “Glen Sannox” with LNG capability is scheduled to begin its services in the winter of 2018-2019. It will operate on the route between Ardrossan in Ayrshire and Brodick on the Isle of Arran and will be able to transport up to 1,000 passengers and 127 cars. “The successful launch of ‘Glen Sannox’ is further confirmation of the vast capabilities we can now offer in Port Glasgow,” said Gerry Marshall, Chief Executive of Ferguson Maritime.

“I would like to thank all of our workforce and subcontractors for their significant efforts in ensuring the successful launch and also their commitment to ensuring we continue to develop the company into a world-leading shipbuilding and marine engineering business,” added Marshall. “I would like to thank CMAL for their continued support and confidence in what we are seeking to achieve in Port Glasgow. We share an ambition to innovate in ferry design and technology and hope the successful launch is a further step in cementing our relationship for the future,” stated Marshall. The second LNG-capable vessel, which has yet to be named, is currently under construction and will eventually enter service on the coast of Argyll and Bute.

FINLAND has seen the completion of its second liquefied natural gas import terminal. The Manga Tornio facility is on the Finland-Sweden border and has received its first LNG cargo ahead of the start of commercial operations. Tornio LNG is a joint venture between Nordic industrial companies Outokumpu and SSAB Europe, the energy company EPV

Energy and LNG supplier Skangas. The LNG shipment arrived on the small-scale carrier, the 15,600 cubic metres capacity “Coral Energy”, chartered by Skangas, a subsidiary of Finnish natural gas company Gasum. The Tornio terminal is larger than the existing Pori facility terminal which has been in operation in Finland since 2016. Tornio is set to become the biggest receiving terminal in the Nordic region when it begins commercial operations. The Tornio terminal will primarily provide natural gas to Outokumpu’s Tornio steel mill.

“However, it will also be a source of LNG fuel in the Bay of Bothnia region of Finland as well as to mining operators, maritime transport and heavy-duty road transport companies in Northern Finland, Northern Sweden and Northern Norway,” said Skangas. The Finnish maritime and gas equipment company and project developer, Wartsila, constructed the terminal that has now reached mechanical completion. Commercial deliveries to customers such as Outokumpu Tornio Works, EPV Energy and SSAB Raahe will begin in mid-2018. “We’re increasing the competitiveness of our steel mill by switching from propane to LNG,” said Martti Sassi, Senior Vice President and Head of Operations for Outokumpu. “At the same time we’re reducing our production costs thanks to more stable energy prices. Our aim is to cut our direct carbon dioxide emissions by 2020, and switching to LNG supports this target very well,” added Sassi.

“The terminal construction project has been a great success,” said Wartsila Business Development Manager Timo Mahlanen. “Almost 1,400 people have taken part in construction work on the site,” he added. “The storage tank with a volume of 50,000 cubic metres and the new terminal will be the largest LNG receiving terminal in the Nordic region,” he added. “The engineering, procurement and construction delivery is backed by a 10-year maintenance contract for Wartsila to provide services related to the needs of the terminal,” the Finnish company said. The terminal was built with company investments of 110 million euros (\$130M). Skangas Chief Executive Kimmo Rahkamo said it was a landmark moment for the first LNG shipment to arrive in Northern Finland. “We’re strengthening Finland’s energy independence and our position as a leading LNG player in the Nordic countries,” he added.

FLEX LNG, the Norwegian company whose shareholders include a fund controlled by shipping magnate John Fredriksen, reported a narrower third-quarter operating loss as it pursued its activities with four chartered carriers and received a loan for some of its own six vessels under construction in South Korea. Flex posted its latest earnings as it continued to study possible import projects with US development company NextDecade. “The company received a firm offer for a \$315 million term loan facility secured by the three newbuildings with delivery in the first half of 2018,” said Flex. That’s as Flex reported an operating loss of \$4.1 million compared with losses of \$7.4M in the second quarter. During the quarter Flex said it operated four chartered-in LNG carriers “to be able to establish a market presence and build an operational track record” in the sector. Flex is awaiting delivery of a total of six M-type, electronically-controlled, gas-injection (MEGI) LNG carriers. Two were originally ordered in 2013 and are currently under construction at Samsung Heavy Industries and are scheduled to be delivered in the second and third quarters of 2018.

Flex has another two MEGI carriers under construction at Daewoo Shipbuilding and Marine Engineering in Korea. “These vessels were acquired from affiliates of Geveran Trading Co., the company’s largest shareholder, and are expected to be delivered in the first quarter of 2018,” said Flex, referring to the Fredriksen stake. The company had entered into another agreement in April 2017 to acquire two additional MEGI tankers under construction at Daewoo from affiliates of Geveran. These vessels are expected to be delivered in 2019. “Upon delivery of the newbuilding vessels, the company will own a fleet of six MEGI LNGCs with the most advanced propulsion and fuel-efficient technology compared to the existing LNG fleet,” it stated. “Over the past months, there has been upward pressure on charter rates as the LNG shipping market has tightened considerably, and we continue to see a trend towards a three-tier market with modern gas injection LNG carriers commanding a premium,” said Chief Executive Jonathan Cook. “As our fleet of newbuildings begins to deliver in the first quarter of 2018, we believe that a continued strengthening of structural fundamentals in the LNG sector will improve the rate environment further

and provide us with various attractive employment options for our vessels,” added Cook.

Flex said it was still actively pursuing opportunities to leverage its experience towards the implementation of floating storage and regasification (FSRU) projects, “although no such opportunities will be committed to on a speculative basis.” The company has signed an accord with NextDecade, the Texas LNG plant developer whose CEO is former senior Shell LNG executive Kathleen Eisbrenner. The informal Flex-NextDecade partnership is seeking to direct volumes to customers from NextDecade’s proposed Rio Grande LNG export plant in the Texan port of Brownsville. “Initially, NextDecade and Flex LNG will develop FSRU and dockside solutions for international customers of NextDecade, with the LNG supply also provided,” Flex said. NextDecade in July 2017 signed an agreement with the Port of Cork in the Republic of Ireland to advance a joint business development opportunity in Ireland for a new FSRU and associated LNG import terminal infrastructure. “Flex continues to support NextDecade to provide a fully integrated LNG import solution for the proposed LNG terminal at the Port of Cork,” the company stated. Flex said in its earnings statement that it expected a growth in demand for natural gas in combination with the recent limited ordering activity of LNG carriers to gradually tighten the shipping market over the course of the next 18 months. In corporate activities, Flex said it transferred its primary Norwegian stock exchange share listing from the Oslo Axess market to the Oslo Bors.

FLUXYS Belgium, operator of the nation’s natural gas transmission network and the Zeebrugge LNG import terminal, and French network operator GRTgaz have launched the first virtual interconnection point in Northwest Europe to enhance natural gas trading opportunities. Fluxys and GRTgaz introduced a system on December 1 called Virtualys, a single virtual interconnection place between the Belgian Zeebrugge Trading Point and the French PEG Nord trading point with a view to facilitating cross-border market activities. “The rationale is that virtual interconnection points will make it easier to flow gas flexibly across the European Union following price signals, hence enhancing competition and gas-to-gas price

formation,” explained Fluxys. GRTgaz is one of Europe's leading natural gas transmission companies, owning and operating 32,450 kilometres of underground pipeline and 28 compressor stations. The new system simplifies network utilisation for shippers with Virtualys combining all physical interconnection points. The introduction of virtual interconnection points is one of the provisions in the European Network Code for capacity allocation mechanisms.

With a view to facilitate cross-border trading, the Network Code requires transmission system operators by 1 November 2018 at the latest to establish virtual interconnection points for marketing available capacity between adjacent markets instead of using multiple physical interconnection points. Virtualys combines all Belgian-French physical gas trading interconnection points. The system's name is a combination of its Internet functionality and the River Lys that flows through both countries. The virtual interconnection point will combine all physical interconnections for high-calorific gas between France and Belgium. These points are: Alveringem, Blaregnies Troll and Blaregnies Segeo for Fluxys - and Alveringem and Taisnières H for GRTgaz. Instead of booking and nominating capacity on one or more of these points, shippers can now manage their flows by simply booking and nominating on Virtualys. “All underlying logistic complexity will be taken care of by Fluxys Belgium and GRTgaz,” the companies said.

Pascal De Buck, Chief Executive of Fluxys Belgium and Thierry Trouve, his counterpart at

GRTgaz, said they were enthused by the launch of the first virtual interconnection point. “Virtualys marks a new step in simplifying network utilisation and will

support further liquidity build-up at the French and Belgian gas trading places,” they said in a joint statement. They also noted that tariffs and existing contracts

remained unchanged. “The transition to Virtualys is straightforward: tariffs and capacity on offer remain the same and no changes to existing contracts are



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required. Capacity will be offered through bundled products on the PRISMA platform,” the two companies explained. Fluxys Belgium’s gas trading involves selling capacity to its customers to transmit natural gas to distribution system operators, power stations and major industrial end-users in Belgium, or to move natural gas to a border point for transmission to other end-user markets in Europe. Among its LNG activities Fluxys Belgium sells capacity for loading and unloading LNG carriers, storing LNG and regasifying it for transmission in the grid. At the Zeebrugge LNG facility, customers can also load LNG trucks to supply industrial sites in Europe where pipeline supplies are not available. They can also supply filling stations for trucks that use LNG as a fuel or refuel ships powered by LNG.

GASUM, the Finnish natural gas company, said it planned to expand its liquefied natural gas filling station network to Sweden and Norway during 2018. Gasum, which also controls the Norwegian LNG supply company Skangas, said the stations would be positioned in strategically relevant locations, expanding the operating range of LNG-powered trucks even further in the Nordic countries. “Gasum believes LNG to be the future fuel for heavy transport. The network of LNG filling stations is growing fast all over Europe, which helps the market and the infrastructure to develop further,” said the company. Finland’s natural gas operator has built out the Finnish LNG filling station network during 2017.

It has opened stations in Helsinki, Turku and Jyväskylä, while a new station will be opened in Vantaa before the end of the year. Gasum is also involved in the newest Finnish LNG import terminal at Tornio, the largest regasification plant in the Nordic region. Gasum gave no details of where the new Norwegian and Swedish LNG fuel stations would be built. “We believe that the timing is right for the expansion as customer demand is rapidly increasing with the emission targets set

by the countries,” said Jukka Metsala, Vice President of Biogas for Gasum. “Several governmental support schemes are set to boost the availability and demand of LNG and LBG in the Nordics,” added Metsala. LNG fuel for trucking is a keystone of European Union and Nordic region policy for road transport.

The trucks fuelled by LNG can also transport it in bulk to broaden fuel distribution to inland areas and to isolated communities not served by pipelines. The company said switching fuels for trucking and road transport from diesel to either LNG or liquefied biogas (LBG) will have a significant impact in reducing greenhouse-gas and pollution from emissions. “The nitrogen-oxide emissions as well as the carbon-dioxide emissions are lower compared to other fossil fuels and the noise emissions produced by LNG-powered trucks is lower,” stated Gasum. “Several vehicle manufacturers such as Iveco, Scania and Volvo Trucks, among others, already offer modern LNG-powered trucks,” noted Gasum.

GAZPROM, the Russian natural gas giant and main supplier of pipeline supplies to the European Union, as well as owner of the expanding Sakhalin LNG plant, has fully re-entered the financial mainstream with an agreement involving JPMorgan Chase Bank of the US and two of the largest Japanese banks. JPMorgan Chase joined Sumitomo Mitsui Banking Corp. and Mizuho Bank of Japan to sign a facility agreement in Tokyo for 1 billion euros (\$1.18Bln) over five years. “The signing of the agreement marked another step in Gazprom’s successful long-term cooperation with the credit organizations,” said Gazprom. Gazprom is the main shareholder in the Sakhalin LNG plant in the Russian Far East, supplying Japanese utilities with around 600,000 tonnes per month of cargoes and with a third Train under development in the southern part of Sakhalin Island.

It is one of the largest financing deals arranged by Gazprom since the 2014 financial sanctions were imposed on Russian energy companies and its biggest

banks over the country’s policies towards neighbour Ukraine. Gazprom was not the subject of US sanctions, though it was shut out of the bond market for a year until October 2017 because of the Ukraine sanctions by the US and the EU that focused on banks. Some of Europe’s largest energy companies Royal Dutch Shell, Austria’s OMV, Germany’s Uniper and Wintershall and France’s Engie are partners in the Gazprom-led Nord Stream II project to bring more pipeline gas to the EU and have already raised packages of hundreds of millions of euros. Nord Stream II is a 750-mile pipeline project to supply an additional 55 billion cubic metres per annum to Europe and is scheduled for start-up in 2019.

Russian pipeline gas supply to Europe is so large in volume that LNG is becoming mainly a top-up or break-bulk energy source for most of the EU countries importing the fuel. It is also the main reason why Germany has had no need for LNG import infrastructure along its coastline. Gazprom exported a record 179.3 Bcm to Europe last year and as of mid-November 2017 had delivered 170 Bcm, exceeding by 13.3 Bcm the amount supplied by the same time last year. The completion date for the Nordstream pipeline coincides with that of the Gazprom pipeline to China that will also be regarded as competition to LNG, though growing Chinese demand is likely to offset oversupply of LNG in Asia through 2020.

GAZTRANSPORT and Technigaz (GTT), the French LNG maritime storage tank firm, has received an order from the Chinese shipyard Hudong-Zhonghua Shipbuilding for its technology for two ships to operate as conventional LNG carriers as well as floating storage and regasification units. GTT said the two carrier-FSRUs vessels would be built at the yard in the Chinese port of Shanghai for European-based LNG fleet owner Dynagas. This is the second major order given to GTT in recent weeks, signalling a revival of the LNG shipbuilding and equipment sectors.

The delivery of the purpose-built LNG

ships is scheduled for 2021. GTT will design the LNG tanks of both units and each will have a capacity of 174,000 cubic metres. The French company said it would use its membrane cryogenic containment system called No. 96 GW, with glass wool insulation. Currently, 14 vessels in operation and 42 on order use this technology. “We are pleased to once again accompany the ship-owner Dynagas in its continued development in the LNG industry and to contribute to the very first FSRUs built by our Chinese partner Hudong-Zhonghua,” said Philippe Berterottiere, Chairman and Chief Executive of GTT. “This new order highlights the trusting relationships GTT maintains with this shipyard, which is part of the biggest shipbuilding group in China,” added Berterottiere.

This is GTT’s second large order confirmed in November 2017 from China’s Hudong-Zhonghua after it was chosen to design cryogenic fuel tanks for nine LNG-fuelled container ships. The shipowner that ordered the vessels is another French company, the container line CMA CGM. The deliveries of the nine vessels will take place between the end of 2019 and 2020. GTT said it was planning LNG fuel tanks, which represent 18,600 cubic metres capacity per ship. The membrane insulation system Mark III developed by GTT has been chosen for its space optimization allowing a maximum usage of cargo capacity. GTT said the LNG-fueled ships would be able to carry 22,000 containers each, instead of 21,000 for the biggest container ships currently in operation. The Hudong-Zhonghua yards are affiliates of the government-owned China State Shipbuilding Corp.

GECEF, the Gas Exporting Countries Forum, the natural gas industry’s version of OPEC, has completed its summit in the city of Santa Cruz in Bolivia, with Qatar pledging to regain its position as the leading liquefied natural gas producer five years after Australia overtakes it in 2019. The event, hosted by Bolivian President Evo Morales, was attended by the 12 member-countries and seven other nations who hold observer status. Qatar’s Minister of Energy Mohammad Bin Saleh Al-Sada said the Gulf nation intended to raise its LNG production by about one-third to reach 100 tonnes per annum and to be fully operational at this capacity by 2024. In his speech to the conference, the minister reviewed the history of the GECEF, which held its first summit in the Qatari capital Doha in 2011.

Diary of events

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

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

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

“Qatar is among the largest producers of LNG, with an annual capacity of 77 MTPA to be among the largest suppliers to the world,” said Al-Sada. The minister praised the status of the GECF, describing it as “a well-established, internationally recognised, professional organisation, providing authoritative, well-researched information on Natural Gas.” The GECF members are Algeria, Bolivia, Egypt, Equatorial Guinea, Iran, Libya, Nigeria, Qatar, Russia, Trinidad and Tobago, United Arab Emirates. The observer-status countries are Venezuela as well as Azerbaijan, Iraq, Kazakhstan, the Netherlands, Norway, Oman and Peru. The members endorsed a 10-point declaration at the meeting, including the reaffirmation of “the essential role of natural gas” as a clean and reliable energy source for sustainable development. It emphasized the importance of natural gas in the global energy mix and in building climate resilient economies in line with the Paris Agreement on reducing greenhouse-gas emissions.

The statement also noted that “the GECF member countries have the largest share of gas reserves and production capacity in the world, and emphasizing their role as reliable suppliers to satisfy energy needs” around the world. The GECF also opposed sanctions measures imposed over recent years against some of its members. “Expressing our deep concern about extra territorial application of laws and regulations and our objection to unilateral economic sanctions, in the gas sector, and particularly against GECF member countries, that are not authorized by the relevant organs of the United Nations,” it said in relation to leading member Iran. The GECF Secretary General is Seyed Mohammad Hossein Adeli of Iran who has led the organization since 2014. It organizes its main conference every two years and the Fifth GECF Summit is scheduled to take place in Equatorial Guinea in 2019.

HOEGH LNG, the Norwegian import terminal developer and fleet operator, said long-term outlook for the floating storage and regasification unit (FSRU) market remains solid, though it warned that ventures were complex and reliant on a host of factors as one of its ventures was cancelled and two others suffered further delays. “Hoegh LNG has this year experienced setbacks related to the three projects under development owing to factors beyond its control,” said the

company, citing projects in Pakistan, Ghana and Chile. “Nevertheless, the group remains confident that it will secure further growth through its current backlog of FSRU contracts and from new contract awards in an active tendering market,” said the Oslo-listed company. Hoegh’s update on its floating import terminal projects came in its third-quarter earnings as it reported a 10 percent rise in revenue to \$64.04 million compared with \$58.05M in the year-ago quarter.

Hoegh also reported a 15.5 percent increase in gross earnings to \$31.6M in the three months to the end of September compared with \$26.5M in the year-ago period. At the end of September, Hoegh said it had \$285M in cash and marketable securities and net interest-bearing debt of \$962M. Hoegh continues to be the largest owner in the FSRU market with seven FSRUs in operation and several others under construction. However, it suffered the cancellation of one project in Pakistan and there were scheduling delays in two other ventures in Ghana and Chile. Hoegh had signed a 20-year FSRU contract in December 2016 with Global Energy Infrastructure (GEI) in Pakistan, which among other requirements was conditional on GEI putting in place the associated infrastructure to connect the FSRU to the domestic pipeline grid. “As part of this process, a consortium consisting of Qatar Petroleum, ExxonMobil, Total, Mitsubishi and Hoegh LNG was formed with the intention to build, finance and operate the infrastructure based on an agreement with GEI,” explained Hoegh. The consortium has “spent considerable time and resources” on finding its final form and structure, however by mid-November it has been concluded that no agreement could be found and the consortium was dissolved. “Due to the withdrawal of the LNG sellers from the infrastructure consortium, and the delays to the original start-up date for the GEI project, Hoegh LNG is evaluating its options with respect to the FSRU contract with GEI,” the company said. Hoegh said it was pursuing alternative opportunities for the FSRU intended to serve the GEI project and remained optimistic it would ultimately be a partner in an FSRU development in Pakistan.

The company said the Ghana FSRU project with Quantum Power was continuing to suffer delays. The FSRU project in Ghana still awaits final government approval. “In the third

quarter, the government of Ghana reached an agreement with Gazprom over long-term gas supply, underpinning the country’s desire to replace expensive liquid fuels with attractively priced LNG. The Quantum Power-Hoegh LNG regasification solution represents a fast-track alternative for Ghana to import LNG, and the dialogue between government entities and Quantum Power is continuing with the target of reaching an agreement,” stated Hoegh. Hoegh additionally explained that the GNL Penco FSRU joint venture in Chile is being further delayed by a revised environmental impact study (EIS) process involving consultation between local environmental authorities and an indigenous interest group. “GNL Penco is currently in dialogue with both parties and the stages undertaken so far are considered in line with the local authorities’ requirements. The indigenous consultation process is one of the steps required before the environmental license may be granted to the GNL Penco FSRU terminal,” stated Hoegh. The company added that provided there were no more significant hurdles, the project could make further progress towards a final investment decision. “However, until the FID is made there will still be uncertainties regarding the project’s timeline,” said Hoegh.

INDIAN LNG imports for the first seven months of the fiscal year from April were on track to be little changed compared with last year because of limited import infrastructure and pipeline capacity and the concentration of all terminals on the West Coast. The country imported 2.42 billion cubic metres of regasified LNG (1.8 million tonnes) last month, a rise of 11 percent compared with the 2.18 Bcm (1.61MT) logged in October 2016. However, the LNG shipments could have been higher if more destinations were available than the three main terminals of Dahej, Hazira and Dabhol, near Mumbai, and the limited Kochi facility in the southwest state of Kerala. Volumes available to Indian companies have risen this year from Trains in Australia and the US in addition to regular suppliers, Qatar and Nigeria. The April-October LNG imports for the first seven months of the fiscal year totaled 14.77 Bcm (10.92MT) versus 14.83 Bcm (10.97MT), down 0.4 percent on the fiscal year to date, according to the figures from the Ministry of Oil and Natural Gas.

Domestic natural gas production increased 2 percent to 2.80 Bcm last month compared with 2.75 Bcm in October 2016. Cumulative production of natural gas for the first seven months of fiscal 2017-2018 was 19.22 Bcm, 4 percent higher than the 18.47 Bcm of output at the same time last year. The government figures showed that LNG shipments during October cost around \$700 million and from April to October cost a total of \$3.3Bln compared with a final expected bill for that period of \$3.8Bln. Analysts say that as global LNG import prices increase with the oil price India’s still partially regulated natural gas market will not easily be able to absorb extra volumes on an economically viable basis. On the issue of infrastructure, among the companies trying to develop LNG capability on the East Coast is Indian Oil Corp., which is proceeding with its Kamarajar Port project in the southeast state of Tamil Nadu and recently raised some financing in a bond sale. The terminal will be owned by IOC’s subsidiary Indian Oil LNG Ltd on a 50-50 joint venture basis with a partner who has yet to be finalized. IOC is one of the stakeholders in Petronet LNG, owner of two import terminals on the West Coast, Dahej and Kochi.

The Kamarajar Port venture and several others will rebalance the nation’s regasification infrastructure with the East Coast capability. IOC has also said it was in the process of sourcing more quantities of LNG directly. The new East Coast terminal is scheduled for completion late in 2018 and IOC said in its latest earnings that project activities were progressing on schedule. IOC is also a stakeholder in the development of a second East Coast terminal, the Dhamra LNG project in the state of Odisha. IOC’s partners in that venture are India’s Adani Group and Gas Authority of India. The second terminal will also cost around \$750M and is expected to start up in 2021. Indian companies such as IOC are participating in the nation’s other infrastructure build-out relating to pipelines. IOC currently operates city-gas distribution networks in Agra and Lucknow through its Green Gas Ltd joint venture with Gas Authority of India. It has also formed a venture with Adani Group to develop city-gas networks on a pan-India basis. The IOC-Adani Gas venture is helping to develop pipeline connections in the cities of Chandigarh and Allahabad and surrounding areas and has also been authorised to develop

city-gas in the cities of Panipat, Daman and Ernakulam.

INEOS, the European petrochemicals company with shale-gas and refinery assets in the UK, said it signed a long-term supply agreement with SP Chemicals of China for the supply of ethane made from US shale gas. Demark-based Evergas currently transports ethane for Ineos from the US to Europe on eight multi-gas carriers.

The Ineos-China deal will involve the construction of a 95,000 cubic metres capacity ship expected to be delivered in 2019 for the Chinese deliveries. The first “Very Large Ethane Carrier” will be part of the Evergas fleet of 23 gas ships and will be built in China under the management of the Jaccar Group, a maritime conglomerate operating more than 500 vessels and led by French entrepreneur Jacques de Chateaufvieux.

Ethane is used to make ethylene, one of the world’s most important chemical building blocks. Ethylene is an important raw material used to make products for a wide variety of industrial and consumer markets such as transportation, electronics, textile and construction. “This is another world first for Ineos after importing shale gas to Europe in 2015,” said David Thompson, Chief Executive of Ineos Trading and Shipping. “By bringing in US shale gas to China for the first time, we are now leading the way in shipping ethane worldwide to meet the needs of an expanding chemicals sector,” he added. SP Chemicals Chief Executive Chan Hian Siang said the deal with Ineos means the shipment for Chinese industry will travel on a journey of more than 18,900 kilometres across the Pacific Ocean from US to Taixing City, located north of Shanghai in Jiangsu Province.

“SP Chemicals will commission a gas cracker plant in 2019 to produce 650,000 tonnes per annum of ethylene,” said Chan. “This first long-term supply agreement for ethane with Ineos will be an important milestone for SP Chemicals to achieve self-sufficiency for its ethylene requirements,” he added. Jaccar Group Chairman De Chateaufvieux commented: “This contract illustrates Jaccar’s ability to offer a comprehensive solution with type C Tri-lobe VLEC tanks developed by JHW Engineering and Contracting, in co-operation with the Hartmann Group up to the contracting to Evergas for shipping operations.” The first shipment of US ethane was unloaded in the UK in September 2016 at the Ineos plant in

Grangemouth, Scotland. Ineos, whose main offices are in the UK and Switzerland, uses shale gas to secure a supply of competitively priced energy and feedstock for its UK and European petrochemicals businesses. Ineos founder and Chairman Jim Ratcliffe believes shale gas could revolutionise UK manufacturing as it has done in the US. The Ineos shale gas subsidiary plans to drill in the UK where it has expanded its holdings to more than 1.2 million acres by acquiring all onshore exploration and development licence interests held by French energy and utility company Engie.

JGC CORP., the Japanese energy and LNG specialist engineering company, said it had joined a floating production, storage and offloading (FPSO) charter project that will help supply offshore natural gas for Ghana as early as 2018 at a time when the West African state is planning LNG import ventures. JGC said it signed the agreement with three other Japanese companies, the trading house Sumitomo Corp., shipping company Kawasaki Kisen Kaisha (K-Line) and the Development Bank of Japan Inc. in concluding a contract with the Malaysian offshore production services provider Yinson Holdings for the purchase of a part of the shares in Yinson’s wholly owned subsidiary, Yinson Production (West Africa) Ltd.

The four Japanese companies will hold 26 percent of the shares and Yinson Production will hold 74 percent. “In its participation in the project, JGC will apply its extensive experience in engineering, procurement and construction in the oil and gas field to provide technical support for the top-side facilities,” said JGC. JGC is one of the leading participants in global liquefaction plant projects. It is currently working on the Ichthys project in Australia and participated in the world’s first FLNG venture for offshore Malaysia. The Japanese company is additionally involved in the Mozambique LNG project and the Jordan Cove development in the US state of Oregon.

JGC said it was now broadening its energy interests in entering the Ghana venture after deciding to strengthen its presence in the offshore field, having already been a participant in the onshore and floating LNG market. “JGC intends to utilize knowledge and expertise that can be obtained through its first involvement in the FPSO owning and chartering business and realize synergy

with EPC and offshore and marine services,” added JGC. The FPSO has been chartered by Italian energy company Eni for 15 years and is scheduled to begin supplying natural gas for domestic consumption in Ghana by mid-2018. Eni started oil production at the offshore Cape Three Point Block (OCTP), located about 60 kilometres off the southwest coast of Ghana in May 2017. The OCTP project and its FPSO named “John Agyekum Kufuor” has capacity to produce 210 million standard feet per day of natural gas and 58,000 barrels of oil per day.

LNG LTD, the developer of two North American LNG export projects, said it had agreed to extend the financial closing date for an offtake agreement with Meridian LNG Holdings Corp., the owner of an import venture proposed for offshore Cumbria in northwest England. LNG Ltd, with fully approved plans to build the Magnolia LNG plant at Lake Charles in the US state of Louisiana and at Point Tupper in Richmond County in the Canadian Atlantic Coast province of Nova Scotia, said the Meridian binding offtake agreement would now run until March 31, 2018. “All other provisions of the governing agreements not specifically amended by this extension remain in full force and effect,” it said.

“LNG’s agreement with Meridian LNG was signed on 23 July 2015 and included firm capacity rights at Magnolia for up to 2 million tonnes per annum for an initial term of 20 years with an option to extend by a further five years,” the company explained. The Chief Executive of the UK-based Meridian LNG project is Roger Whelan who formed Liberty Natural Gas in the US in 2008 and subsequently merged it into a unit of the Canadian equity fund West Face Capital. Meridian also has a joint development agreement with Hoegh LNG of Norway for the operation of two floating storage and regasification units for the project in England. Meridian has been assembling strategic assets in recent years to develop a business in the global gas value chain.

In addition to its liquefaction tolling agreement with the Magnolia plant and its joint development accord with Hoegh to invest in FSRUs and LNG carriers, it has a gas sales agreement with German utility and energy company Uniper. LNG Ltd said recently it was continuing to focus on marketing efforts to secure more tolling agreements for Magnolia and for the Canadian venture called Bear Head

LNG. Its Magnolia project engineering, procurement and construction contract with the joint venture comprising KBR of the US and South Korea’s SK Engineering and Construction has also been extended in the past year. The turn-key, lump-sum EPC accord for the Magnolia plant runs until 31 December 2017 and is likely to be renewed until a date in 2018.

MARUBENI Corp., the Japanese trading house and LNG player, along with shipping company Mitsui OSK Lines, signed an accord with Russian natural gas firm Novatek to conduct a study on establishing an LNG trans-shipment and marketing complex in the Russian Far East. The trans-shipment port, similar to one agreed for the Zeebrugge terminal in Belgium, would handle cargoes from the Yamal LNG export plant in Arctic Russia, set to commence commercial operations in early 2018. The Kamchatka Peninsula, located between the Pacific Ocean to the east and the Sea of Okhotsk, has been chosen for the study.

“This project will create offshore infrastructure to trans-ship LNG cargoes from ice-breaking LNG ships to standard ships,” a statement said. “The LNG will be produced at projects Novatek is implementing in the Arctic region,” the companies added. “The project will ensure flexible LNG supply to the Asia-Pacific region,” they explained. “Marubeni and MOL will contribute not only to the mutual relationship between Japan and Russia, but to the stable supply of LNG to the Asian-Pacific region, including Japan,” the companies stated. Fluxys Belgium, the operator of the Zeebrugge LNG terminal and the Belgian natural gas transmission network, has a 20-year agreement to welcome ships from the Russian Yamal plant to trans-ship cargoes when the Northern Sea Route is closed.

The Zeebrugge facility will provide unloading and loading operations for trans-shipment services from ice-breaker LNG carriers to conventional LNG vessels under the contract with Yamal Trade. In addition to starting up the Yamal plant at the Arctic port of Sabetta with more than 16 million tonnes per annum of output, Novatek is studying the possible development of a second liquefaction plant called the Arctic LNG-2 project, also in Siberia. The new liquefaction plant would likely be located offshore and near the remote Gydan Peninsula in Northwest Siberia. The

Novatek venture currently envisages the installation of three gravity-based structures in Ob Bay and construction of the LNG plant on these platforms.

NEXTDECADE, the US company proposing to build the Rio Grande LNG export project in Texas, said it could take a final investment decision for as few as two Trains rather than the six in its initial plans. Such a downgrade would mean its facility would have output of 9 million tonnes per annum rather than 27 MTPA. NextDecade, the developer of one of three LNG export terminals proposed for near the port Brownsville in south Texas, said that while it was sticking to its original proposal, it did not need to build all six production Trains for the project to be economic. “The project is scalable up to 6 trains (27 MTPA). NextDecade intends to develop the full 6-Train plant at Rio Grande LNG, but does not need to develop the full-scale facility in order to offer customers significant cost advantages, environmental benefits and reliable LNG supply,” it said in a project update. NextDecade, whose Chief Executive is former Shell senior LNG executive Kathleen Eisbrenner, is advancing through the Federal Energy Regulatory Commission process.

“NextDecade expects to receive a notice of schedule for its Rio Grande LNG project in the near future and to receive a final authorization in the second half of 2018,” it stated. The start-up of the first two Trains has been scheduled for around 2021-2022. The company noted that it had “a seasoned leadership team with marketing and development experience to execute its projects” and strong partnerships in the institutional asset management community. The statement comes as the second wave of liquefaction and export plants being developed mainly on the Gulf Coast, though also in other regions, have traditionally secured firm long-term take-or-pay contracts with international buyers to underpin the billions of dollars in construction costs. Analysts say that LNG buyers in Asia are avoiding long-term contracts as they envisage that there will be sufficient liquidity in the supply market for cargoes to be at low prices in the future because of a campaign led by Japan to move away from contracts linked to the oil price.

NextDecade is developing its own marketing strategy and has a joint venture relationship with Flex LNG, the Norwegian company awaiting the delivery of six LNG carriers, some of

which can be chartered as floating storage and regasification units for import projects. The informal partnership would see NextDecade being a supplier for import projects that could use Flex vessels. The Eisbrenner-run company has already reached a preliminary agreement with the Irish authorities for an import project in the Port of Cork that could act as a European LNG hub. NextDecade has said that its engineering, procurement and construction cost estimate is \$478-\$502 per tonne of LNG and that it was trying to lower that cost to \$450 per tonne. The company has booked global LNG construction company CB&I of the US as its likely lead engineering, procurement and construction contractor. One of NextDecade’s market competitors, the Tellurian company of former Cheniere Energy CEO Charif Souki, recently announced that Bechtel of the US would be its main contractor with cost estimates of \$550 per tonne of LNG.

OMAN LNG said its three liquefaction Trains at the facilities near the port of Sur on the Arabian Peninsula are expected to be at full capacity for the rest of this year and 2018. The turnaround in LNG output is underpinned by the 1.5 billion cubic feet per day of output from BP’s Khazzan natural gas project that came on stream in September. “Our three Trains are now almost at full capacity of 10.5 million tonnes a year,” said Oman LNG Chief Executive Harib Al-Kitani at an event in London. The plant last year exported a total of 8.12MT of LNG and just 7.56MT the previous year. “This is a great improvement compared with recent years when the plants ran at 75 percent capacity,” the CEO noted. Concern over meeting rising domestic demand prompted Oman LNG to announce in 2015 that it would have to divert all its exported volumes from foreign markets and toward domestic consumers unless more gas was found.

The three liquefaction Trains come from the amalgamation of Oman’s two previously separate operating companies, Qalhat LNG and Oman LNG, now run under one banner. The Omani government allocates Oman LNG supplies from various gas fields. Over recent years, increasing domestic gas demand had forced the government to hold back some of the allocations for LNG exports and output dropped. However, the additional supplies brought on stream at the Khazzan fields has closed the sultanate’s energy gap. “Financially, 2017

was not so bad. However, 2018 will be a year of full production and it will be a boost for our finances,” said Al-Kitani. In the period when production cuts were forced on Oman LNG’s three liquefaction Trains because of a lack of feed-gas, the Omani government had even begun talks with Iran about importing feed-gas by pipeline from the Persian Gulf. “The government has found more gas, we’re filling up the plant and everything’s fine,” said Al-Kitani.

More natural gas exploration activities are also progressing, led by Italian energy company Eni, which in recent years has made huge natural gas discoveries offshore Egypt and Mozambique. Eni has just entered into an exploration and production sharing agreement for Block 52 offshore Oman and has also brought on board Qatar Petroleum. The licence covers an under-explored area with potential located offshore the Arabian Peninsula in the southern region of Oman. The signing ceremony took place in the capital Muscat, assigning 85 percent of the licence rights of the 90,000 square kilometres area to Eni as the operator of the block and 15 percent to state-owned Oman Oil Company Exploration and Production. During the same event, Eni and Qatar Petroleum, owner of the LNG plant at Ras Laffan in Qatar, signed another accord for the assignment of 30 percent of Eni’s interest in Block 52 to the Qataris.

OSAKA GAS, one of the leading Japanese utilities and liquefied natural gas importers, has launched a pilot project in Thailand to make a form of LNG fuel from agricultural waste for use in vehicles. The utility company said it would ascertain the feasibility of supplying natural gas to vehicles by removing carbon dioxide and other impurities from biogas generated mainly from waste from the palm oil industry. Osaka Gas said the project was scheduled to run for about one year, during which time it would be testing and operating a biogas refining facility with capacity of 250 cubic metres per hour to then become a commercial operation. “The project will focus on a verification of a stable operation and methods to minimize the cost of producing methane gas, as well as determining the effectiveness of the methane produced as a vehicle fuel,” said the company.

The project is located at Nakhon Si Thammarat, a Thai city about 600 kilometres south of Bangkok on the East

Coast of the Malay Peninsula. “Osaka Gas has been engaged in developing biogas refining technology since 2012 to effectively utilize unused biogas, promote energy preservation and help protect the environment,” it stated. “The company is capable of producing high purity methane gas with the world’s highest efficiency in methane recovery at a rate of over 99 percent,” Osaka Gas added. The system is based on a hybrid biogas refining plant, combining a carbon-dioxide separation membrane with Pressure Swing Adsorption (PSA), a technology that selectively adsorbs and removes CO₂. “Since agriculture is one of Thailand’s most prominent industries, as a consequence there is an abundance of biomass resources,” said the Japanese company.

“These include palm residue, the remnants of sugarcane crushed to extract juice and food factory wastewater. Natural gas vehicles are also becoming increasingly prevalent in Thailand,” it added, “Osaka Gas decided to carry out this pilot project in Thailand based on its confidence in the potential towards the reduction of greenhouse gas emissions by using its unique hybrid biogas refining system,” the company stated. The Thai partner of Osaka Gas in the venture is Agricultural Basin Company (ABC) Ltd and it will use the refined methane gas as fuel in its own natural gas-powered vehicles.

PEMBINA Pipeline Corp. of Canada has approved investments of around US\$1.3 billion for 2018, including a proportion of spending to make progress on the Jordan Cove LNG export plant planned for the Northwest US state of Oregon. Pembina said it would spend about C\$170M on what it calls “value chain extension” projects, including C\$135M (US\$105M) on Jordan Cove. “The company plans to spend approximately C\$135M towards progressing its proposed Jordan Cove LNG project,” said Pembina. Pembina, which closed its takeover of original Jordan Cove developer Veresen Inc. of Canada in October 2017, said it expected a decision on the LNG liquefaction plant from US regulators by the end of 2018. “Jordan Cove officially filed its application with the Federal Energy Regulatory Commission in September 2017 with the company expecting an outcome during the second half of 2018,” said Pembina in outlining its latest spending plans. “Pembina continues to

focus on securing binding agreements for the long-term sale of natural gas liquefaction capacity at the export terminal, as well as securing the regulatory and environmental permits for both the terminal and the associated pipeline,” it stated.

Jordan Cove if approved would be constructed at Coos Bay in Oregon to produce 7.8 million tonnes per annum of LNG for export to Asian markets. It would be the only LNG export facility on the US West Coast and proposals include the related Pacific Connector Gas Pipeline to transport natural gas from the Malin Hub in southern Oregon to the Coos Bay export plant. “It has been a transitional year in Pembina's history,” said Mick Dilger, Pembina's President and Chief Executive. “Since the beginning of 2015, we have placed approximately \$8 billion of predominately contracted assets into service, marking the culmination of an unprecedented growth strategy,” added the CEO. “In addition, we also completed the largest corporate acquisition of our company's history during the year. We expect to continue this positive momentum into 2018, as we remain focused on completing the remaining growth portfolio and advancing our strategy of creating new market access for our customers,” stated Dilger. New capital projects include an export terminal for liquefied petroleum gas (LPG) at the Port of Prince Rupert in the Canadian Province of British Columbia.

Prince Rupert had been the site chosen by several LNG export plant developers who cancelled their ventures because of economic factors and tougher Canadian federal regulatory conditions for the hydrocarbon industry in general. “The Prince Rupert Terminal will be located on Watson Island on lands leased from a wholly-owned subsidiary of the City of Prince Rupert,” said Pembina. “Through site assessments and engagement with key stakeholders, the company has confirmed Watson Island as the ideal location for the project to be developed and has executed definitive commercial agreements with the City,” added the company. “Since our initial announcement of potentially developing the Prince Rupert Terminal, we've worked diligently with municipal and other stakeholders and are now able to move forward with our final investment decision,” it stated. The Prince Rupert terminal is expected to have a permitted capacity of approximately 25,000 barrels per day of LPG and is expected to be in service

mid-2020, subject to Pembina receiving necessary regulatory and environmental approvals. “We are very excited to progress the Prince Rupert Terminal and continue working with the local communities, stakeholders, First Nations and governments in the area,” Pembina added.

PETRONAS, the Malaysian energy company, plans to offer gas-up and cool-down services for the global LNG carrier fleet from its liquefaction plant at Bintulu port in Sarawak in competition to other ports such as Singapore. Petronas said the services at Bintulu would start in 2018, positioning the port and liquefaction plant at Bintulu as one of the main global LNG hubs, making it one of the few ports in the world to offer this facility. The gassing-up and cooling-down, known as GUCD, is a service for maritime storage tanks on LNG carriers, for example after dry-docking, and to cool down the tanks to cryogenic temperature before loading its next cargo. The Malaysian company's subsidiary, Petronas LNG, has signed an accord with Bintulu Port authorities for the provision of marine support services for GUCD in Bintulu for a trial period of three years.

“The GUCD services is a niche and specialised service to be offered by Petronas and the Port of Bintulu,” said Ahmad Adly Alias, Petronas Vice President for LNG marketing and trading. “This collaboration is expected to enhance Petronas' portfolio of services in the integrated (LNG) value chain,” he added. Singapore offers operators of LNG carriers GUCD services at its Jurong Island import terminal, which is seen convenient for vessels on maintenance visits to shipyards in the region such as Keppel. Petronas will offer ample competition in the GUCD market as one of the leading Asian LNG producers and a world leader in floating LNG production.

The company produces more than 28 million tonnes per annum of LNG from the onshore Bintulu plant in Sarawak, which came on stream in 1983 and has output from seven liquefaction Trains. Petronas also became the first FLNG producer when the “PFLNG Satu” processing hull entered commercial service in early 2017 after being deployed over the Kanowit gas field offshore Sarawak. The FLNG venture has nameplate capacity of 1.2 MTPA and a second FLNG vessel is scheduled to enter service in 2020. That production hull is designed to produce 1.5 MTPA using feed-

gas from the Rotan field, about 80 miles offshore of Sabah, the Malaysian state in the northern part of the island of Borneo.

QATAR National Bank said the Gulf state's LNG production overseen by Qatar Petroleum would continue to seek long-term contracts to ensure stable output and to use oil price indexation. “Despite the market being oversupplied, Chinese buyers have had a difficult time finding LNG because most supplies are locked up in long-term contracts, leaving less than a third of the total LNG supply available on the global spot market,” QNB explained in a report. However, the bank noted that the approaching expiry of some long-term contracts could push more LNG sales onto the spot market and result in shorter contract lengths. “We expect this gradual shift to continue in the coming years but most of the market, particularly major producers like Qatar, will still operate on long-term contracts providing buyers with long-term energy security,” said the report.

It also explained that the global LNG market was operating very differently from the crude oil market. “There is no singular LNG benchmark price and the market is heavily segmented by region,” it said. “In North America and Europe today, LNG trade is conducted on shorter contract lengths and pricing generally reflects market fundamentals of supply and demand,” the report added. “We expect this gradual shift to continue in the coming years but most of the market, particularly major producers like Qatar, will still operate on long-term contracts providing buyers with long-term energy security,” QNB noted. It pointed out that the volume of LNG traded was relatively low in Europe and North America because of the “mature pipeline infrastructure” through which higher volumes of gas are supplied.

In Asia, where 70 percent of global LNG supply is destined, buyers have historically sought to secure the commodity on contracts of 20 years or more to ensure steady shipments. QNB said the steady cash flow to producers in recent years has shored up investments in the sector, which in turn has prevented shortages and price spikes for consumers. The bank explained that market changes were occurring because of two factors, including shale gas from the US offering a new source of supply to the market and lower prices, incentivising buyers to move to shorter contracts. “As a result, buyers are looking at US gas prices as a floor for

the market which will persist as US LNG exports continue to grow,” the report said. QNB added that secondly, the long-term outlook for LNG demand was increasingly looking more bullish than that of oil. “Projections of LNG demand reveal growth of over 3-5 percent per year until 2030, while base case oil demand growth is expected to be around 0.5-1.0 percent per year over the same period,” said the report

SHELL Chief Executive Ben Van Beurden said he saw “underlying strength” in the liquefied natural gas market and the company's resilience and good financial performance came from its leadership in LNG and gas-to-liquids. His statement came as he updated investors on the company's strategy, setting out LNG and energy market ambitions, as well as plans to reduce the net carbon footprint of its oil and gas output and products. “Our next steps as we re-shape Shell into a world-class investment is to ensure that our company can continue to thrive, not just in the short and medium term but for many decades to come,” said Van Beurden. “These steps build on the foundations of Shell's strong operational and financial performance, and my confidence in our strategy and our ability to deliver on the promises we make,” he said. In the Integrated Gas division, including the Anglo-Dutch company's LNG activities, the CEO said the resilience and good financial performance of the company continues to be underpinned by its position as a leader in both the LNG and the gas-to-liquids value chains.

He stated that Shell saw “underlying strength” in the natural gas and LNG markets. “To sustain its strength and competitive advantage in LNG through the 2020s, the company will continue to assess opportunities for selective growth - cost competitiveness will be a key decision criterion,” he stated. The Shell CEO said the Upstream division has implemented a successful and continuing operational excellence programme, delivering more production and lower costs. The Downstream unit continued to deliver strong financial performance, due to highly integrated refining, trading and marketing operations and premium products. Shell groups its seven strategic themes into three categories, cash engines, growth priorities and emerging opportunities. The company groups Integrated Gas, conventional oil and gas and Oil Products as “cash engines”. Deep

water projects and Chemicals are “growth priorities” and shales and new energies are “emerging opportunities”.

“Illustrating the dynamic nature of the company’s portfolio, the intention is for deep water to have become a cash engine by 2020 and shales to have become a growth priority by 2020,” he explained. Shell recently launched an initiative with ExxonMobil and other major energy companies to cut greenhouse-gas emissions from natural gas projects. On this theme, Shell said it would continue to reduce its net carbon footprint. “Shell further positioned itself for the future by unveiling its ambition to cut the net carbon footprint of its energy products by around half by 2050. As an interim step, by 2035 it will aim for a reduction of 20 percent,” it said. The company will measure its progress by disclosing the net carbon footprint not just from its operations and energy use, as it does now, but also from the use of its energy products, expressed in grams of carbon-dioxide per megajoule consumed. “Tackling climate change is a cross-generational, global and multi-faceted effort,” stated Van Beurden. “This is a challenge for the whole planet, for all of society, for customers, for governments and indeed for businesses. It will mean meeting increasing energy demand with an ever-lower carbon footprint. We are committed to play our part,” the CEO said.

SPANISH net liquefied natural gas imports rose to 22 cargoes in October, led by Nigerian shipments as domestic demand increased for industrial users and for gas-fired power generation. The LNG shipments were up 45 percent from the net 15 cargoes logged in October. The Barcelona regasification facility in the northeast of Spain received eight out of the total of 22 shipments imported. The Huelva terminal in the southwest of the country was the second busiest in October and handled six cargoes. The Bilbao facility in northwest Spain received four cargoes and the Cartagena terminal in the southeast received three shipments, while the Mugardos facility, in the northwest, unloaded one shipment.

While most of the imports came from Nigeria, shipments were also unloaded from Qatar, Peru, Norway and Trinidad. Among the Nigerian cargoes that arrived, the 141,000 cubic metres capacity carrier “LNG Akwa Ibom” delivered a shipment on October 14 to the Huelva terminal from the Bonny Island plant in Nigeria.

The 145,700 cubic metres capacity carrier “LNG Benue” unloaded another Nigerian cargo on October 23 at the Bilbao terminal. A third Nigerian shipment came in on October 29 to the Barcelona terminal on the 165,000 cubic metres capacity carrier “Marib Spirit”.

Spain was the largest European importer last year followed by the UK, France and Turkey. The Spanish Enagas network received 10.17 million tonnes of LNG in 2016 compared with 8.82MT the previous year when it re-exported more shipments. Enagas, the natural gas transmission network owner, is the main operator of Spain’s LNG terminals. It fully owns the facilities in Barcelona, Cartagena, Huelva and Gijon. It also has 50 percent of the facility in Bilbao and over 70 percent of the Saggas terminal in Sagunto. Enagas said demand for domestic natural gas in Spain rose by 8 percent in October compared with October 2016, reaching around 29,300 gigawatt hours. The network operator said that for the first 10 months of 2017 demand for natural gas in Spain increased by more than 9 percent compared with the same period of 2016, mainly due to the 7.3 percent growth of industrial demand.

US Trade and Development Agency officials have launched a gas infrastructure initiative to help with the development and financing of projects for future importers of US LNG. Partners in the initiative include the US Chamber of Commerce and the International Gas Union, organizer of the 27th World Gas Conference in Washington DC in June 2018. “The initiative is designed to connect American companies to new export opportunities across the gas value chain in emerging economies,” the agency stated at a launch event in Arlington, Virginia. “As US LNG export terminals are coming online, USTDA is expanding its partnership with the American gas industry to generate new LNG exports through the development of gas-related infrastructure in key LNG receiving countries,” it explained.

As part of the initiative, the USTDA announced a call for gas-related project proposals for US companies that have identified project sponsors in high-growth emerging markets. The agency said several forthcoming gas sector trade missions will bring prospective overseas LNG buyers and gas infrastructure decision-makers to the US for site visits and meetings with US industry. Under this section of the program, visitors are

expected from China and Africa. “USTDA appreciates the opportunity to partner with US industry to launch this important initiative,” said USTDA Director (Acting) Thomas R. Hardy. “We are confident that it will advance the gas infrastructure goals of our partner countries, while connecting US companies to new export opportunities,” added Hardy.

As a part of the initiative, USTDA is participating in the 17th US-China Oil and Gas Industry Forum in Ningbo, China and the Latin America and Caribbean Gas Options Forum in Panama City, Panama. “These regional gas forums bring together government officials and private sector representatives who are developing the gas sector in these markets,” it said. “Under the initiative, USTDA will use the full breadth of its proven toolkit to support American gas industry jobs, including early stage project preparation assistance that informs how infrastructure projects will ultimately be designed, financed and implemented,” the agency stated.

WISON Offshore and Marine, the Chinese company whose shipyard affiliate has expertise in the floating LNG sector, has signed a cooperation agreement that could lead to China building more floating storage and regasification units (FSRUs) to act as import facilities. Shanghai-based Wison said it had agreed to cooperate with the Wuhan Rules and Research Institute of the China Classification Society (CCS) on developing FSRUs. Under a strategic cooperation agreement, the parties will embark on a wide range of joint efforts in the development and the optimization of the LNG vessels. This will include technical standards, design and review, joint research of new technologies and

the exchange of know-how.

“As well as improving China’s FSRU construction standards, such cooperation is set to promote commercial applications of floating LNG solutions in the country, nurturing LNG development in this huge market,” said Shanghai-based Wison and the CCS. Wison said the agreement comes at a time when China has suffered some natural gas supply shortages triggered by the accelerated shift away from coal as environmental requirements become increasingly stringent. As the turnkey service provider for the first FSRU ever constructed in China, Wison has accumulated project experience in floating LNG facilities. The company is also involved in the hull construction sector for gas liquefaction, LNG transportation and delivery and gas-power vessels.

“We’re delighted to partner with the CCS’s Wuhan Rules & Research Institute whose strengths in technical research can be leveraged in our joint contributions to the formulation of FSRU technical standards in China,” said Ying Cui, Chief Executive of Wison Offshore & Marine. “We hope floating LNG import solutions that have been widely adopted in global market can better serve the Chinese market, offering a more flexible and economical option to access LNG supply,” added Ying. As a key body directly under the CCS, the Wuhan Institute specializes in value chain studies with a special focus on technical standard specifications for LNG marine applications. “We are very pleased to work with Wison whose practical project experiences will bring great value to our research,” said Luo Xiaofeng, the Institute Director. “Based on the common understanding of industry trends, we both are fairly confident in the promising future of our strategic partnership,” added Luo. ■

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Chart Industries outlines brazed aluminum heat exchanger benefits for LNG plant optimisation

Doug Ducote and Paul Shields of Chart Industries

Brazed aluminum heat exchangers (BAHX), also referred to as plate fin heat exchangers, are increasingly at the heart of liquefaction processes, including those for both standard and modular plant solutions that are enabling small-scale and mid-scale LNG.

The BAHX equipment is challenging the paradigm that a large baseload facility provides the best economy of scale.

Modular plant solutions, featuring BAHX, can be installed onshore and offshore.

Capacities

Although the terms small-scale and mid-scale liquefaction have been adopted into common industry parlance, there are no defining liquefaction capacities to denote either, or indeed a fixed point at which the cross-over between the two occurs.

For the purposes of discussion it's useful to reference plant size but, in reality, it's more useful to consider plant characteristics when attempting a definition.

In terms of economic cost and the time-scale of building a plant, standardization sits at the opposite end of the spectrum to the custom design of base-load LNG plants, and somewhere in between lies modularization.

If these traits are aligned with the generic descriptors of LNG plant sizes, then the following is a good foundation for an overall definition:

Generally speaking, the liquefaction capacity at which the use of brazed aluminum heat exchangers is economically feasible is around 100 tons per day (tpd) (62,000 gallons per day (gpd)), so we can make this our starting point for small-scale LNG.

Practicality

The upper limit for small-scale LNG is a little more arbitrary, but is predominantly based on the practicality of maximizing standard equipment packages within a fixed mechanical design for a portfolio of capacities, which resulted in Chart developing three standard plant solutions, each with nominal liquefaction capacities of approximately 100,000 gpd (165 tpd), 250,000 gpd (400 tpd) and 450,000 gpd (700 tpd) respectively.

Increased mid-scale capacities are achieved through multiple identical liquefaction modules rather than a single custom plant.

The modular approach is proven to deliver reduced capital cost and faster project execution through maximized shop fabrication and reduced field construction. Each single mid-scale module would generally be engineered to provide between 1,000,000 gpd and 3,000,000 gpd (0.5 MMTA to 1.5 MMTA).

BAHX capacity can be designed to match the largest aero-derivative gas turbines available, making train size a natural fit and an efficient and cost-effective modular design.

Small-scale LNG plants are typically being built for regional diesel displacement for fueling vehicles and heavy horsepower engines, such as drill rigs, while the mid-scale model is a feature of many of the North American export terminals currently at various stages of approval.

Heat exchange

Despite being widely used in cryogenic gas separation processes since the 1950's, including liquefaction of LNG from the 1970s, the characteristics of BAHX that make them especially pertinent for cryogenic processes are still not widely understood.

Brazed aluminum heat exchangers are highly efficient, custom designed compact heat exchange devices that offer distinct advantages over alternative heat exchange methods.

They are manufactured as an all brazed and welded pressure vessel with no mechanical joints and are designed in accordance with major pressure vessel codes throughout the world. BAHX are applied in a variety of cryogenic and non-cryogenic heat transfer applications, ranging from LNG production, industrial gas production, petrochemical and hydrocarbon processing, and hydrogen and helium liquefaction.

Given their high surface area compactness and the superior heat transfer capability inherent to aluminum, they are a cost-effective solution for processing of non-corrosive liquids and

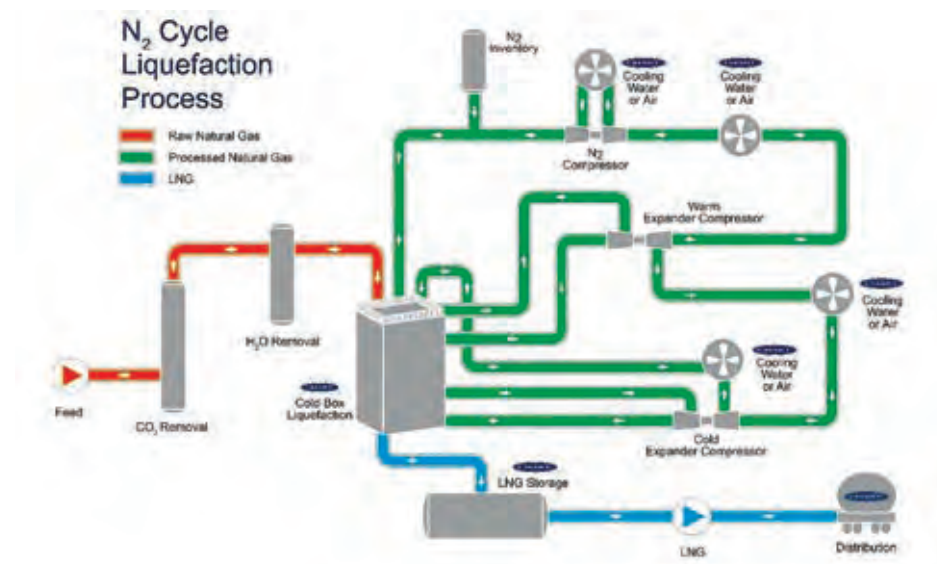


Figure 1: Nitrogen cycle process scheme

gases when compared to alternative heat transfer technologies.

BAHX construction

The main components of the core are the fins (secondary heat transfer surface), parting sheets (primary heat transfer surface) and side bars.

The components are stacked in an alternating pattern of hot versus cold.

The key to bonding the structure together is the brazing process. An aluminum alloy is applied to the parting sheet surface and once the core is stacked and heated in the vacuum brazing furnace the alloy melts, wetting the surface of adjacent components. When cooled, the alloy returns to solid state, effectively sealing the components together.

There are four main fin types that provide the secondary heat transfer surface and are one of the main contributors of the high thermal efficiency of BAHXs compared to other heat exchanger types.

Plain fins are typically used in the distributor section where the fluids are moved and turned from the inlet ports into the heat transfer section. Perforated, herringbone and serrated fins are used in the heat transfer section and their primary function is to break up the boundary layer of the fluids as they move through the unit.

The boundary layer is essentially resistance to heat transfer, so the more often that is broken up, the more effective the heat transfer surface will be.

However, this also results in more pressure drop, hence the skill of the design engineer is to find the optimal

balance between thermal and hydraulic performance and, at the same time, ensure that the mechanical design requirements are also met.

To illustrate the compactness of BAHX, the design provides a heat transfer area density of approximately 1000 to 1500 m²/m³, which is six to 10 times greater than a coil wound heat exchanger and at least 20 times greater than conventional shell-and-tube technology.

Advantage

This characteristic advantage of a BAHX, coupled with the enhanced heat transfer performance of aluminum plate-fin construction and optimized heat transfer fin designs, results in significantly lower cost (25-50% less) and substantially lower weight (95% less) than is provided by a stainless-steel, shell-and-tube exchanger.

When process UA requirements exceed what can be delivered in a single core block, several BAHX can be piped or manifolded together in parallel or series to accommodate nearly unlimited flow or duty requirements. BAHX are generally supplied in a carbon steel modular structure called a cold box for ease of insulation, support, and installation.

The flexibility of BAHX allows multiple heat exchange services (10 or more streams in a single block) to be combined into a single compact application. BAHX technology enables pinch analysis along with all the energy minimizing benefits.

This feature significantly reduces installation and operation costs, engineering, insulation, support systems, testing, documentation, transportation

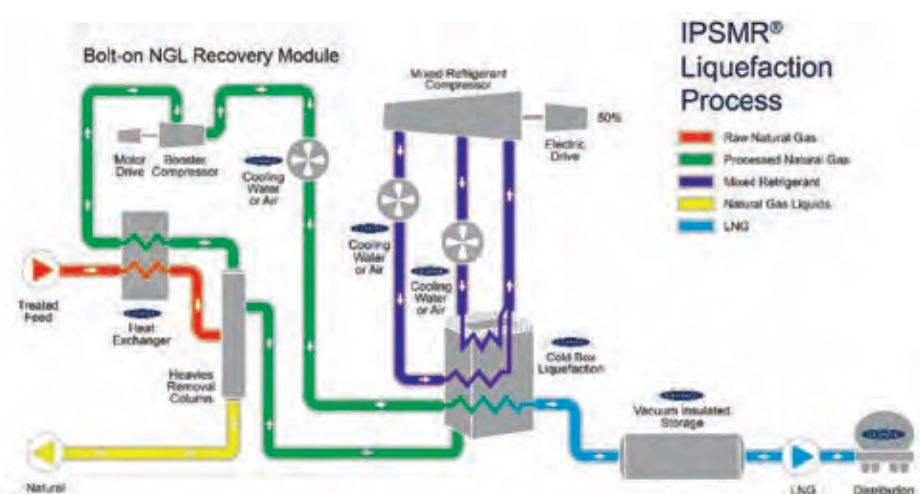


Figure 2: IPSMR® process technology scheme

and site arrangements.

Summary of Key BAHX Features

- multi-stream capability means the entire cooling requirement can be contained in a single unit or series of single units manifolded in parallel for larger plants
- thermal conductivity of aluminum is much better than steel
- increased thermal efficiency through tight approach temperatures
- hydraulic performance of BAHX affords excellent turn down capability
- superior heat transfer surface area per unit volume
- aluminum gets stronger at cold temperatures

BAHX in the liquefaction process

Aluminum plate-fin exchangers possess distinct advantages in most LNG processes. Minimizing power consumption (or maximizing LNG production for a selected turbine/compressor model) is a key design criterion for liquefaction processes, creating an inherent requirement for highly efficient heat exchange.

Process efficiency is gained by minimizing temperature approach between the hot and cold streams. As the temperature approach decreases, the required surface area increases. With that in mind, the heat exchanger of choice must offer high surface area economically and we've seen that a BAHX accomplishes that.

There are several refrigeration cycle configurations that can be utilized to liquefy natural gas, but small- and mid-scale LNG principally focuses on two; nitrogen cycle and mixed refrigerant cycle. Each cycle has its advantages and disadvantages when evaluated for use in a specific application.

Usually designers study the trade-offs between power consumption and equipment utilization. This analysis

allows them to optimize the liquefier for the total plant cost (capital plus operating costs). Comparison of operating costs should focus on the energy consumption of the refrigeration system, as the balance of plant should be essentially the same for all processes.

Nitrogen Cycle

Nitrogen cycles are simple to operate and eliminate the need for the use and storage of hydrocarbons as refrigerants. They offer advantages to operators that do not want to spend the capital and energy to extract their hydrocarbon refrigerants from the treated feed gas and are ideally suited to remote areas that do not have easy access to hydrocarbons for refrigerants. However, simplification comes at the expense of higher specific energy consumption.

Mixed Refrigerant Cycles

Mixed Refrigerant (MR) processes are based on mixtures of light hydrocarbons and nitrogen, normally a single mixture system with or without precooling. In some instances, the processing scheme utilizes dual mixture systems.

Process optimization is achieved by varying the mixture of refrigerant components and operating pressures in a manner that essentially allows the heating curve of the refrigerant to mirror the cooling curve of natural gas in a tight temperature approach.

The brazed aluminum exchanger accommodates the surface area requirements resulting from the tight approach temperatures and log mean temperature difference (LMTD).

Its inherent multi-stream capability also allows the process engineer to add or remove refrigeration along the process thermal gradient, wherever needed, to optimize process efficiency. A single service main liquefaction BAHX has been integral part of MR base load, mid-scale, and peak shaving plants since the early 1970's.

Another advantage to the process is the use of a single service compressor to provide the refrigeration pressure boost.

IPSMR® process technology

In cases where the condition of the inlet gas is outside the range supported by the liquefier design, the design can be supplemented with customized modules to ensure system functionality.

Similarly, and as shown in the scheme above, a module can also be added to recover the potentially high value natural gas liquids, which can be sold separately to further improve the plant economics.

Examples of modules can include:

- Feed Gas Compression
- Heavy Hydrocarbons Removal
- Ethane Rejection
- Nitrogen Rejection
- Water and Carbon Dioxide Removal
- Mercury Removal
- Sulfur Removal

For the smallest small-scale LNG plant Chart offers a nitrogen cycle process but, as capacities within small-scale LNG grow, and for all mid-scale LNG applications, Chart recommends a mixed refrigerant process. Chart's own

proprietary Integrated Pre-cooled Single Mixed Refrigerant (IPSMR®) process is comparable to dual mixture processes, but less complicated. It was designed specifically to minimize operating differential temperature in the BAHX, which significantly reduces the possibility of overstress from plant upset conditions and also improves process efficiency.

To ensure the robustness of the BAHX for LNG applications, state-of-the-art software is coupled with in-house engineering expertise and experience to perform advanced transient thermal analyses.

Chart has developed proprietary in-house transient thermal analysis software that can utilize operating data or dynamic simulation process data to determine the internal fluid and metal heat exchanger temperatures and the associated thermal stresses imparted on the exchanger.

These analyses can be carried forward to predict potential fatigue damage and life expectancy of the equipment. Dynamic simulation is used to simulate operation of the BAHX and plant upset conditions to ensure process technologies are designed with proper controls to mitigate situations that introduce thermal stresses. ■



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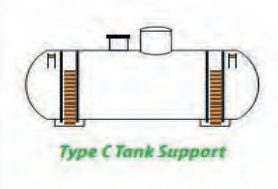
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Japan commissions newest LNG import terminal amid plans for using depleted gas fields for storage

Japan Petroleum Exploration Co. increases presence in LNG imports, purchases, natural gas storage and pipelines

Japan's new Soma LNG import terminal owned by Japan Petroleum Exploration Co. (Japex) and located in Fukushima Prefecture in eastern Japan, near where the nuclear disaster happened in March 2011, is completing its commissioning process.

The commissioning shipment was sourced by Malaysia and arrived in December on board the 137,100 cubic metres capacity carrier "Puteri Intan Satu", owned by Malaysia International Shipping Corp. and chartered to Malaysian energy company Petronas.



The 'Akebono Maru' small-scale LNG carrier owned by Japex for shipments to satellite terminals

Operations

"Commissioning of the terminal took effect from December 1, 2017, with the aim for full commencement of operation in March 2018," said Japex.

Japex had been a shareholder in the cancelled Canadian LNG export project, the Pacific Northwest venture planned for British Columbia and in which Petronas was the largest shareholder.

Japex's Soma terminal gives Japan 35 regasification facilities and satellite terminals in its network as it consolidates its position as the world's biggest LNG importer.

The Soma terminal was constructed by the leading LNG engineering company JGC Corp., better known for building overseas export plants.

It has a single storage tank with 137,000 cubic metres of capacity and two berths to accommodate imports as well as shipments from small-scale domestic LNG carriers.

Events

Soma is a coastal city located in the Hamadori area of Fukushima and partially destroyed by the tsunami caused by an earthquake in 2011 that led to fires and explosions at the nuclear plant owned by Tokyo Electric Power Co.

The city of Soma is 45 kilometres from the destroyed Fukushima nuclear plant.

Japan badly needs additional LNG import facilities as only four of the nation's more than 50 nuclear power generating reactors have come back on line since the Fukushima disaster.

"This LNG terminal is planned to receive and store LNG from overseas to

provide vaporized gas to our gas network via the Soma-Iwanuma Gas Pipeline also under construction, and to supply LNG by satellite system such as domestic vessels to the Yufutsu LNG receiving terminal and LNG tank trucks in regions," explained Japex.

"As the first LNG terminal in Fukushima, this terminal is expected to contribute to the revitalization of neighbouring regions through the development of new regional clusters of industry, creating job opportunities, and activating local communities, led by supplying natural gas and other energy sources," it added.

This terminal will supply regasified LNG to the Fukushima Natural Gas Power Plant which is under construction adjacent to the terminal.

Regasification

Two others Japanese import terminals were opened before the Soma facility, one for Tokyo Gas in 2015 at Hitachi and a second at Hachinohe built for JX Nippon Oil, a shareholder in the Papua New Guinea LNG production plant.

Another facility, the Kushiro LNG terminal in Hokkaido, was also opened as a satellite receiving terminal for LNG coastal tankers from Hachinohe.

In addition to its large regasification terminals, Japan has about half a dozen smaller satellite facilities.

Japex has been a pioneer of operating satellite LNG facilities in Japan.

The company's LNG supply involves transportation via tank trucks and the railways.

"Japex has been operating an LNG satellite system in order to meet natural gas demand in regions that are not served by gas pipelines," it said.

"Since 1984, Japex has been delivering LNG to our clients via tank trucks. Since 2000, we have been supplying LNG to clients in wider areas using LNG tank containers via railway - a method developed by Japex," the company explained.

By rail

"Transportation by railways using LNG tank containers is an environmentally friendly method of transportation with lower carbon-dioxide emissions compared to tank trucks," it noted.

Japex is also involved in operates oil and gas production at ten domestic fields in Hokkaido, Akita, Yamagata and Niigata prefectures.

"To maintain and expand our domestic oil and gas reserves, Japex has been conducting E&P activities strategically and proactively to combine efficiently with explorations for the addition of new large-scale reserves and pursuing growth of reserves in the vicinity of existing fields," the company said.

"The domestic natural gas business is one of our core businesses in Japex. We are developing an integrated natural gas supply system under the 'Gas Integration' initiative, which is composed of upstream (gas field exploration and development), midstream (transportation methods such as pipelines, tank containers via railways, tank trucks, and coastal vessels) and downstream (sales to clients including the Local Distribution

Companies (LDCs), electric power companies, and industrial users).

Based on this initiative, we aim to further enhance our capability to provide a long-term stable supply of natural gas, with competitive prices and security," said Japex.

"We believe that expansion of our infrastructure and business scale is necessary to compensate for the decline of production in domestic gas fields and maintain our stable supply.

"By diversifying both our supply methods and procurement sources of natural gas, Japex aims to increase our handling volume of natural gas in stages - we will strive to become a 1.5 million tonnes natural gas supplier (in LNG equivalent) in 2019 and a 2.5 million tonnes supplier by 2025," stated the company.

Pipeline network

Japex owns and operates a domestic natural gas pipeline network with a total length of more than 800km as a core strategic asset to further expand sales. The pipelines start from our gas fields and LNG terminals, and supply clients (including LDCs, industrial facilities, gas-fired power plants and others) with natural gas.

The company is also using more underground natural gas storage. Japex utilizes the Shiunji gas field in Niigata Prefecture for storage.

"This enables us to flexibly respond to clients' demands for natural gas to deal with seasonal fluctuations. We are also considering the utilization of underground storage for vaporized LNG,"

it added. Japex has also been involved in trials over recent years on using depleted gas fields as tanks and underground gas storage. Japex conducted the first field trial of regasified LNG underground storage-reproduction in Japan at the Shiunji Gas Field.

The company's engineers evaluated the mixing and replacement behavior between original gas and regasified LNG, studied gas quality management and the operating efficiency of regasified LNG injection.

Evaluation

"Also, we conducted a simulation study and evaluated the potential of underground regasified LNG storage for an actual condensate-gas field 'A' in Japan," the company explained.

"The field test at Shiunji Gas Field was held from in 2015, injecting almost 50,000 cubic feet of regasified LNG and reproducing gas immediately after injection.

"We constructed a reservoir simulation model to replicate the observed behavior and to verify the mixing mechanism between original gas and regasified LNG.

"The result of field observation was that the heat value of reproduced gas began to decrease gradually before the total volume of the injected regasified LNG was produced. From the gas composition distribution in the simulation, changes in reproduced gas properties were attributed to mixed gas production," it explained.

"This implies that mixing had occurred underground near the boundary of the two gases even in the short duration from injection to reproduction, and that this mixing phenomenon is mainly caused by dispersion mechanism.

Field results

"We estimated the storage capacity for regasified LNG at field 'A'. As the result, the storage and reproduction capacity of this field was found to be approximately 50 BCF of regasified LNG, although some uncertainty of the capacity was estimated. It was found that there was sufficient

potential for underground gas storage and reproduction," the company said.

"We were able to acquire valuable information regarding the handling of regasified LNG, with a view towards the deployment of regasified LNG underground storage to actual fields in Japan," Japex stated.

As a leading Japanese E&P company, Japex has outstanding achievements both domestically and overseas and has been acquiring and accumulating extensive ranges of core E&P technologies since its establishment.

While many oil and gas E&P companies outsource some parts of these technologies, the Japex Group has highly technical capabilities to complete oil and gas E&P projects themselves.

Japex has been investing in new prospects and developing ongoing projects in our overseas focus areas: Southeast Asia, Canada, the Middle East, the North Sea, and Russia (Sakhalin).

Also, in order to secure stability in production, reserves, and revenue, Japex aims to optimize our investment portfolio through acquisitions of various assets including in the phases of production, undeveloped discoveries, and exploration.

Japex participates in a shale-gas project in British Columbia, Canada through Japex Montney Ltd., which has

been a consolidated subsidiary from April 2013, and has been developing and producing shale gas together with partners including a subsidiary of Petronas, which is the Malaysian state-owned company as the operator of the project.

This was to have been one of the feed-gas source for the LNG project.

Significant volumes of shale gas assets have been confirmed in the area. The average daily production rate of shale gas was most recently 577 million cubic feet per day, and produced gas has been sold into the market of western Canada.

"Japex with the operator and other partners will continue to optimize the development and production plan accordingly to monetize these assets effectively," the company said.

Indonesia

Japex also has international operations, including a natural gas field in Indonesia. The Indonesian Terang gas field produces 38,000 barrels of oil equivalent per day.

It has a 25 percent interest of the Kangean Block offshore of East Java, Indonesia. The commercial production of natural gas from the Terang gas field is part of the block commenced in May 2012.

The Terang gas field is located 90km

north of Bali Island at a water depth of 90 metres and is part of the TSB (Terang, Sirasun and Batur) gas field complex.

Average gas production from five horizontal production wells in the Terang gas field is steadily rising to around 220 million cubic feet per day (approximately 38,000 barrels of oil equivalent per day), and cumulative production from the field has achieved 70 million barrels of oil equivalent in January 2017.

Natural gas produced in the Terang gas field is supplied to the government-operated electric power company and fertilizer factories in the suburbs of Surabaya, East Java, via the East Java Gas Pipeline after being processed at subsea production facilities and a floating production unit (FPU).

"Supplying natural gas from the field contributes to stable energy supply and economic growth in Indonesia where demand for natural gas is significantly increasing," said Japex. ■

This article contains extracts from the paper "First Field Trial of Regasified LNG Underground Storage: The Reproduction & Evaluation of large-Scale Underground Storage Capacity of a Gas Field in Japan". The paper was written by Tomoya Ohata, Reservoir Engineer, Japan Petroleum Exploration Co. with co-authors: Tomonori Hasegawa, Toshiyuki Anraku, Masanori Nakano and Ryo Ueda, all business staff and managers at Japex.



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How major consumer Japan sees current LNG policies of major participants it has talked to

Some prominent exports and importers explain their varied objectives

The LNG Producer-Consumer Conference held in Tokyo late in 2017 was attended by more than 1,200 participants from 32 countries and regions, including 12 cabinet ministers.

The Conference was hosted by the Japanese Ministry of Economy, Trade and Industry (METI) and the Asia Pacific Energy Research Centre (APEREC).

The Japanese Ministry has outlined what it sees as the current policies of all the countries who attended:

Here are the LNG policies as outlined at the conference:

Brunei: “ASEAN recognizes importance of natural gas, shares a policy objective of increasing the share of natural gas in the region as an energy source, and will also become one of the largest LNG markets in the world. This was recognized in the East Asia Summit (EAS). As supply and demand of LNG grows, the market is becoming more flexible and emerging/small-scale consumers are gaining power. New types of LNG contracts are being adopted including those with a shorter contract period, smaller transaction volume, more flexibility, or pricing which is not linked to the oil price. Small-scale LNG for transportation/generation is also seeing cost reduction. Brunei is going to work together with Japan in a hydrogen-supply project as well.”

India: “Gas-producing countries and consuming countries can cooperate in establishing an LNG market which is transparent, highly flexible, efficient, and competitive. To promote the use of LNG, as clean energy, India plans to develop receiving capacity of 50 million tonnes per year by 2022. Based on the recent change in the market environment, producing and consuming countries should work together to create a more flexible contract form in terms of price revision, destination restrictions, and the take or pay clause.”

Indonesia: “The prospects of Indonesia’s gas production continue to be promising for the next 20 years and the country can continue to export LNG. Gas is a major fuel for the domestic power source and PLN, the national power company, plans to develop infrastructure

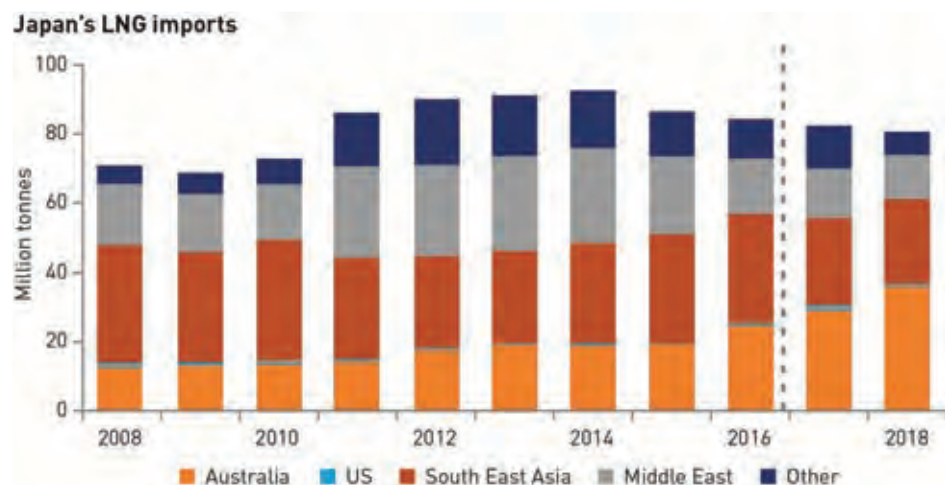
for diversification of fuel procurement. Small and medium-scale infrastructures are important for Indonesia especially because our country is made up of 800 islands. Receiving terminals are planned mainly in the eastern part of the country, and we will develop receiving facilities combined with small-scale LNG and thermal power generation.”

Malaysia: “The world’s LNG market is undergoing a great change including the entry of new players. Governments of various countries will have important roles in expanding the market going forward, including an improvement in the investment environment. Petronas has so far put a high priority on both flexibility and security. If the LNG price is not high enough to attract new developments, investment will fall and eventually the LNG industry as a whole will stagnate. Secure demand is as important for suppliers as secure supply is for buyers. The key will be cooperation between the both sides.”

Myanmar: “We have positioned natural gas as a major energy source and as a clean energy source. While our domestic power demand surges, a number of offshore gas fields are seeing reduced output. For this reason, LNG is expected to play an important role as an alternative energy source, replacing the conventional home-produced gas until new gas fields are developed.”

Mozambique: “We have one of the largest natural gas reserves in the world and is at a geographically advantageous location to the growing Asian market. LNG development is a key to Mozambique’s economic and social development and we are aiming to become a trusted LNG supplier. Investment for the first LNG project has been approved. Having set our sights on becoming an LNG exporter in the early 2020s, we are now working on our political environment and regulatory framework. We are set to make decisions required for realizing both offshore and onshore LNG projects.”

Papua New Guinea: “We are basically aiming to secure domestic power supply by expanding LNG from the PNG project which is already in operation while



Japan's own LNG imports have reached a plateau

promoting industrial development, thereby attracting more investment and developing human resources required for domestic industries. We also set our sights on realizing another one or two LNG projects going forward. To make this reality, we consider it important to promote cooperation between the government and corporations and make sure that regulations are reliable and procedures are reasonable.”

Philippines: “We are currently obtaining 22 percent of power from gas-fired generation. However, output from our gas fields is falling and we plan to import LNG as an alternative energy source. We are going to announce new natural gas regulations and promote investment in gas-related facilities through system improvements. We have a plan to become an LNG hub of Asia by taking advantage of our strategically favourable geographical location, and will make intensive construction of LNG receiving facilities from 2021 to 2024.”

Qatar: “As a trusted supplier, Qatar will continue stable export of LNG going forward without being affected by recent changes in relationship with surrounding countries. Long-term contract pricing of LNG should not be affected by prices which reflect short-term supply-demand fluctuations. It should be linked to a price based on liquid and transparent market transactions, and the crude oil price will be an indicator for a long-term contract price for the time being.”

South Korea: “Consumers in South Korea now have better control of supply-demand adjustment thanks to the greater flexibility of the LNG market. South

Korea’s energy policies include shutdowns of nuclear power plants within 60 years, the phase-out of old facilities for coal-fired power generation, increasing the renewable energy percentage (20 percent in 2030), using LNG as long as it’s economically feasible. To establish a transparent market, we propose 1) improvement of contract forms including a relaxation of destination restrictions, 2) development of new demand through cooperation between producers and consumers, and 3) establishment of an LNG hub in Northeast Asia.”

Thailand: “While domestic gas demand will increase, home-produced gas and pipeline-imported gas will fall. As a result, domestic LNG demand is expected to reach 36 million tonnes in 2036. To meet this increase in demand, Thailand is now going ahead with a total of seven receiving terminals. In LNG procurement, our country places importance on a balance among three factors: a reasonable price, third-party access to all facilities and energy security.”

Vietnam: “With an aim to meet increasing energy demand in the country and promote introduction of clean energy, Vietnam will also increase LNG consumption going forward. We will prepare a regulatory framework concerning imports and constructing LNG receiving facilities in five to six locations from 2025 to 2030. LNG import are expected to reach 5 million tonnes in 2025. As we do not have adequate knowledge of the LNG business, we will welcome investment from other countries, which will also help develop our domestic LNG industry.” ■

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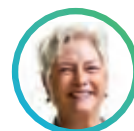
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LNG carrier	Capacity m ³	Owned or Ordered by	Builder	Delivery Date	Flag	Power Plant	Cargo System	No. of tanks	Ship built for Export plant
Aamira	266,000	QGTC	Samsung	Dec-10	Liberia	DRL	TZ Mk. III	5	Qatargas IV
Abadi	135,000	Brunei Gas Carriers	Mitsubishi Nagasaki	Jun-02	Brunei	S	Moss	5	Brunei LNG
Abalamabie	174,900	Bonny Gas	Samsung	June-16	Bermuda	DFDE	TZ Mk III	4	Nigeria LNG
Adam LNG	162,000	Oman LNG	Hyundai	Dec-14	Marshall Is.	DFDE	TZ Mk. III	4	Oman LNG
Al Aamriya	210,100	J5 Consortium	Daewoo	Feb-08	Marshall Is.	DRL	GT NO 96	4	Qatargas
Al Areesh	151,700	Teekay LNG	Daewoo	Jan-07	Qatar	S	GT NO 96	4	Ras Gas II
Al Bahiya	266,000	QGTC	Samsung	Oct-09	Liberia	DRL	TZ Mk. III	5	Qatar-Atlantic
Al Biddah	135,275	J4 Consortium	Kawasaki Sakaide	Nov-99	Japan	S	Moss	5	Qatargas
Al Daayen	151,700	Teekay LNG	Daewoo	Apr-07	Qatar	S	GT NO 96	4	RasGas II
Al Dafna	266,000	QGTC	Samsung	Oct-09	Marshall Is.	LR DRL	GT NO 96	4	Qatar-Atlantic
Al Deebel	145,000	Peninsular LNG	Samsung	Dec-05	Bahamas	S	TZ Mk. III	4	Qatargas
Al Gattara	216,200	OSG/Nakilat	Hyundai	Oct-07	Marshall Is.	DRL	TZ Mk. III	4	Qatargas II
Al Ghariya	210,100	ProNav	Daewoo	Feb-08	Bahamas	DRL	GT No. 96	4	Qatargas
Al Gharaffa	216,200	OSG/Nakilat	Hyundai	Jan-08	Marshall Is.	DRL	TZ Mk. III	4	Various
Al Ghashamiya	216,000	QGTC	Samsung	Mar-09	Liberia	DRL	TZ Mk. III	4	Qatar-Atlantic Basin
Al Ghuwairiya	261,700	QGTC	Daewoo	Aug-08	Marshall Is.	DRL	GT NO. 96	5	Qatar-Atl'c Basin
Al Hamla	216,000	OSG	Samsung	Feb-08	Marshall Is.	DRL	TZ Mk. III	4	QatarGas
Al Hamra	137,000	National Gas Shipping	Kvaerner-Masa	Jan-97	Liberia	S	Moss	4	ADGAS
Al Huwaila	217,000	Teekay	Samsung	May-08	Bahamas	DRL	TZ Mk. III	4	RasGas III
Al Jasra	137,100	J4 Consortium	Mitsubishi Nagasaki	Jul-00	Japan	S	Moss	5	Qatargas
Al Jassasiya	145,700	Maran-Nakilat	Daewoo	May-07	Greece	S	GT No 96	4	RasGas
Al Kharaitiyat	216,200	QGTC	Hyundai	May-09	Liberia	DRL	TZ Mk. III	4	Qatargas III
Al Kharaana	210,000	QGTC	Daewoo	Oct-09	Marshall Is.	DRL	GT NO 96	4	Qatargas IV
Al Kharsaah	217,000	Teekay	Samsung	May-08	Bahamas	DRL	TZ Mk. III	4	RasGas III
Al Khattiya	210,000	QGTC	DSME	Oct-09	Marshall Is.	DRL	GT No. 96	4	Qatargas IV
Al Khaznah	135,500	National Gas Shipping	Mitsui Chiba	Jun-94	Liberia	S	Moss	5	ADGAS
Al Khor	137,350	J4 Consortium	Mitsubishi Nagasaki	Dec-96	Japan	S	Moss	5	Qatargas
Al Khuwair	217,000	Teekay LNG	Samsung	Jul-08	Korea	DRL	TZ Mk. III	4	RasGas
Al Mafyar	266,000	OSG/Nakilat	Hyundai	Oct-07	Marshall Is.	DRL	TZ Mk. III	4	Qatargas II
Al Marrouna	151,700	Teekay	Daewoo	Nov-07	Bahamas	S	GT NO 96	4	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 Orai	210,000	J5 Consortium	Daewoo	Apr-08	Marshall Is.	DRL	GT No. 96	4	Various
Al Rayyan	135,360	J4 Consortium	Kawasaki Sakaide	Mar-97	Japan	S	Moss	5	Qatargas
Al Rekayyat	216,200	QGTC	Hyundai	Jun-09	Bahamas	DRL	TZ Mk.III	4	Qatar-Atlantic
Al Ruwais	210,100	ProNav	Daewoo	Nov-07	Germany	DRL	GT NO 96	4	Qatargas II
Al Sadd	210,100	QGTC	Daewoo	Mar-09	Liberia	DRL	GT NO 96	4	Qatar-Atlantic Basin
Al Safliya	210,100	ProNav	Daewoo	Dec-07	Bahamas	DRL	GT NO 96	4	Qatargas II
Al Sahla	216,200	J5	Hyundai	Jun-08	Japan	DRL	TZ Mk. III	4	Ras Gas III
Al Samriya	261,700	QGTC	Daewoo	Sep-08	Marshall Is.	DRL	GT NO. 96	5	Qatargas II
Al Sheehaniya	210,100	QGTC	Daewoo	Feb-09	Liberia	DRL	GT NO 96	4	Qatar-Atlantic Basin
Al Shamal	217,000	Teekay LNG	Samsung	Jun-08	Qatar	DRL	TZ Mk. III	4	RasGas
Al Thakhira	145,000	Peninsular LNG	Samsung	Sep-05	Bahamas	S	TZ Mk. III	4	Qatargas
Al Thumama	216,000	J5 Consortium	Hyundai	Apr-08	Japan	DRL	TZ Mk. III	4	Rasgas
Al Utouriya	215,000	J5	Hyundai	Sep-08	Panama	DRL	TZ Mk. III	4	RasGas
Al Utourma	215,000	J5	Hyundai	Sep-08	Panama	DRL	TZ Mk. III	4	Ras Gas III
Al Wajbah	137,350	J4 Consortium	Mitsubishi Nagasaki	Jun-97	Japan	S	Moss	5	Qatargas
Al Wakrah	135,360	J4 Consortium	Kawasaki Sakaide	Dec-98	Japan	S	Moss	5	Qatargas
Al Zhubarah	137,570	J4 Consortium	Mitsui Chiba	Dec-96	Japan	S	Moss	5	Qatargas
Alto Acrux	147,000	LNG Marine Transport	Mitsubishi	Mar-08	Bahamas	S	Moss	4	Various
Amali	148,000	Brunei-Shell	DSME	Jul-11	Brunei	DFDE	GT No. 96	4	Brunei LNG
Amanl	154,800	Brunei-Shell	Hyundai	Nov-14	Brunei	DFDE	TZ Mk. III	4	Brunei LNG
Aman Bintulu	18,928	Perbadanan / NYK Line	NKK Tsu	Oct-93	Malaysia	S	TZ Mk. III	3	Petronas
Aman Hakata	18,800	Perbadanan / NYK Line	NKK Tsu	Nov-98	Malaysia	S	TZ Mk. III	3	Petronas
Aman Sendai	18,928	Perbadanan / NYK Line	NKK Tsu	May-97	Malaysia	S	TZ Mk. III	3	Petronas
Arctic Aurora	160,000	Dynagas	Hyundai	Jul-13	Marshall Is.	DFDE	TZ Mk. III	4	Various
Arctic Discoverer	140,000	K Line	Mitsui Chiba	Jan-06	Bahamas	S	Moss	4	Various
Arctic Lady	147,200	MOL/Hoegh LNG	Mitsubishi Nagasaki	Apr-86	Norway	S	Moss	4	Various
Arctic Princess	147,200	MOL/Hoegh LNG	Mitsubishi Nagasaki	Jan-06	Norway	S	Moss	4	Various
Arctic Sun	89,880	Arctic LNG Shipping	IHI Chita	Dec-93	Liberia	S	IHI SPB	4	ConocoPhillips/Marathon
Arctic Voyager	140,000	K Line	Kawasaki	Jul-06	Bahamas	S	Moss	4	Statoil
Arkat	148,000	Brunei-Shell	DSME	Feb-11	Brunei	DFDE	GT. No. 96	4	Brunei LNG
Arwa Spirit	165,000	Teekay LNG	Samsung	Sep-08	Marshall Is.	DFDE	TZ Mk. III	4	Various
Aseem	154,850	K Line-Petronet	Samsung	Nov-09	Malta	S	GT No 96	4	Qatar-India
Asia Endeavour	160,000	Chevron	Samsung	Dec-14	Bahamas	DFDE	TZ Mk. III	4	Various
Asia Energy	160,000	Chevron	Samsung	Sept-14	Bahamas	DFDE	TZ Mk. III	4	Various
Asia Excellence	160,000	Chevron	Samsung	Sept-13	Bahamas	DFDE	TZ Mk. III	4	Various
Asia Venture	160,000	Chevron	Samsung	Sept-17	Bahamas	DFDE	TZ Mk. III	4	Various
Asia Vision	160,000	Chevron	Samsung	June-14	Bahamas	DFDE	TZ Mk. III	4	Various
Barcelona Knutsen	173,400	Knutsen	Daewoo	May-10	N.I.S.	DFDE	GT NO 96	4	Various
Bebatic	75,060	Brunei Shell Tankers	Atlantique	Oct-72	Brunei	S	TZ Mk. I	6	Brunei LNG
Beidou Star	172,000	MOL	Hudong	Oct-15	Hong Kong	DRL	GT NO. 96	4	Various
Berge Arzew	138,088	BW Gas	Daewoo	Jul-04	Norway	S	GT NO 96	4	Sonatrach
BW GDF-Suez Boston	138,059	BW Gas	Daewoo	Jan-03	Norway	S	GT NO 96	4	Suez LN
BW GDF Suez Everett	138,028	BW Gas	Daewoo	Jun-03	Norway	S	GT NO 96	4	Suez LNG
BW Integrity	170,000	BW Gas	Samsung	May-17	Singapore	DFDE	TZ Mk. III	4	FSRU
BW Pavilion Leeara	161,880	BW Gas	Hyundai	Feb-15	Singapore	DFDE	TZ Mk. III	4	Various
BW Pavilion Vanda	161,880	BW Gas	Hyundai	Feb-15	Singapore	DFDE	TZ Mk. III	4	Various
BW Singapore	170 000	BW Gas	Samsung	May-15	Singapore	DFDE	TZ Mk. III	4	FSRU
BW Suez Paris	162,400	BW Gas	Daewoo	May-09	N.I.S.	DFDE	GT NO 96	4	Yemen-Atlantic
Bilbao Knutsen	138,000	Knutsen / Marpetrol	IZAR Sestao	Jan-04	Spain	S	GT NO 96	4	Atlantic LNG
Bilis	77,730	Brunei Shell Tankers	La Seyne	Mar-75	Brunei	S	GT NO 82	5	Brunei LNG
Bishu Maru	162,000	K Line-Transpacific	Kawasaki Sakaide	Dec-15	Panama	S	Moss	4	Australia-Japan
British Diamond	155,000	BP Shipping	Hyundai	Sep-08	IOM	DFDE	TZ Mk. II	4	Indonesia-Various
British Emerald	155,000	BP Shipping	Hyundai	Jun-07	UK	DFDE	TZ Mk. III	4	Tangguh LNG
British Innovator	138,200	BP Shipping	Samsung	Jul-03	Isle of Man	S	TZ Mk. III	4	Various



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British Merchant	138,000	BP Shipping	Samsung	Apr-03	Isle of Man	S	TZ Mk. III	4	Various
British Ruby	155,000	BP Shipping	Hyundai	Jan-08	U.K.	DFDE	TZ Mk. III	4	Various
British Sapphire	155,000	BP Shipping	Hyundai	Sep-08	IOM	DFDE	TZ Mk. III	4	Tangguh
British Trader	138,000	BP Shipping	Samsung	Dec-02	Isle of Man	S	TZ Mk. III	4	Engas
Broog	135,466	J4 Consortium	Mitsui Chiba	May-98	Japan	S	Moss	5	Qatargas
Bu Samara	266,000	QGTC	Samsung	Dec-08	Qatar	DRL	TZ Mk. III	5	Qatargas
BW Suez Paris	162,400	BW Gas	Daewoo	May-09	N.I.S.	DFDE	GT NO 96	4	Yemen-Atlantic
BW Suez Brussels	162,400	BW Gas	Daewoo	May-09	N.I.S.	DFDE	GT NO 96	4	Yemen-Atlantic
Cadiz Knutsen	138,826	Knutsen / Marpetrol	IZAR Puerto Real	Jun-04	Spain	S	GT NO 96	4	Engas
Castillo de Santisteban	173,600	Elcano	STX	Aug-10	Malta	S	GT NO. 96		Various
Castillo de Villalba	138,000	Elcano	IZAR	Nov-03	Spain	S	GT NO 96	4	Sonatrach
Catalunya Spirit	138,000	Teekay LNG Partners	IZAR Sestao	Mar-03	Liberia	S	GT NO 96	4	Atlantic LNG
Celestine River	145,000	KLNG	Kawasaki	Dec-07	Bahamas	S	Moss		Various
Cesi Beihai	174,100	MOL-China LNG	Hudong	June-17	Hong Kong	S	GT No 96	4	Australia-China
Cesi Gladstone	174,100	MOL-China LNG	Hudong	Oct-16	Hong Kong	S	GT No 96	4	Australia-China
Cesi Qingdao	174,100	MOL-China LNG	Hudong	Nov-16	Hong Kong	S	GT No 96	4	Australia-China
Cesi Tianjin	174,100	MOL-China LNG	Hudong	Sept-17	Hong Kong	S	GT No 96	4	Australia-China
Cheikh Bouamama	75,500	Skikda LNG Transport	USC	Jul-08	Bahamas	S	TZ Mk. III	4	Sonatrach
Cheikh El Mokrani	75,500	Med LNG Corp	USC	Jun-07	Bahamas	S	TZ Mk. III	4	Sonatrach
Christophe de Margerie	172,600	SCF	Daewoo	Nov-16	Cyprus	DFDE	GT NO 96	4	Various
Clean Energy	150,000	Dynagas	Hyundai	Mar-07	Marshall Is.	S	TZ Mk. III	4	Various
Clean Force	150,000	Dynagas	Hyundai	Jan-08	Marshall Is.	S	TZ Mk. III	4	Various
Clean Ocean	155,900	Dynagas	Hyundai	Mar-14	Marshall Is.	DFDE	TZ Mk. III	4	Various
Clean Planet	155,900	Dynagas	Hyundai	Mar-14	Marshall Is.	DFDE	TZ Mk. III	4	Various
Clean Vision	160,000	Dynagas	Hyundai	Jun-15	Marshall Is.	DFDE	TZ Mk. III	4	Various
Cool Explorer	160,000	Thenamaris	Samsung	Oct-13	Bermuda	DFDE	TZ Mk. III	4	Various
Cool Runner	160,000	Thenamaris	Samsung	May-14	Bermuda	DFDE	TZ Mk. III	4	Various
Cool Voyager	160,000	Thenamaris	Samsung	Oct-13	Bermuda	DFDE	TZ Mk. III	4	Various
Corcovado LNG	160,106	TMSC Gas	Daewoo	Jun-14	Malta	TFDE	GT No 96	4	Various
Creole Spirit	174,000	Teekay	Daewoo	Jan-16	Bahamas	MEGI-DF	NO. 96 GW	4	Cheniere
Cubal	160,400	Mitsui/NYK/Teekay	Samsung	Jan-12	Bahamas	DFDE	TZ Mk. III	4	Various
Cygnus Passage	145,400	Cygnus LNG	Mitsubishi	Feb-09	Panama	S	Moss	4	Various
Dapeng Moon	147,000	China Ships	Hudong	Jul-09	China	S	GT NO 96	4	Various
Dapeng Star	147,000	China Ships	Hudong	Nov-09	China	S	GT NO 96	4	Various
Dapeng Sun	147,000	China Ships	Hudong	Jul-07	China	S	GT NO 96	4	Woodside Energy
Disha	136,000	Petronet LNG Ltd.	Daewoo	Jan-04	Malta	S	GT NO 96	4	Qatargas
Doha	137,350	J4 Consortium	Mitsubishi Nagasaki	Jun-99	Japan	S	Moss	5	Qatargas
Duhail	210,100	ProNav	Daewoo	Jan-08	Germany	DRL	GT NO 96	4	Various
Dukhan	135,000	J4 Consortium	Mitsui Chiba	Oct-04	Japan	S	Moss	4	Qatargas
Dwiputra	127,385	Humpuss Consortium	Mitsubishi Nagasaki	Mar-94	Bahamas	S	Moss	4	Pertamina
Ebisu	147,547	Golar LNG	Kawasaki	Sep-08	Bahamas	S	Moss	4	Various
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
Flex Endeavour	173,400	Flex LNG	Daewoo	Jan-18	Marshall Is.	TFDE	GT NO 96	4	Various
Flex Enterprise	173,400	Flex LNG	Daewoo	Jan-18	Marshall Is.	TFDE	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 Geneva	174,000	GasLog	Samsung	Sept-16	Bermuda	TFDE	TZ Mk. III	4	Shell charter
Gaslog Gibraltar	174,000	GasLog	Samsung	Oct-16	Bermuda	TFDE	TZ Mk. III	4	Shell charter
Gaslog Glasgow	174,000	GasLog	Samsung	Jun-16	Bermuda	TFDE	TZ Mk. III	4	Shell charter
Gaslog Greece	174,000	GasLog	Samsung	Mar-16	Bermuda	TFDE	TZ Mk. III	4	Shell charter
GasLog Salem	165,000	GasLog	Samsung	Apr-15	Liberia	TFDE	TZ Mk. III	4	various
GasLog Santiago	155,000	GasLog	Samsung	Mar-13	Liberia	TFDE	TZ Mk. III	4	Various
GasLog Saratoga	155,000	GasLog	Samsung	Dec-14	Bermuda	TFDE	TZ Mk. III	4	Various
Gaslog Savannah	155,000	GasLog	Samsung	May-10	Bermuda	DFDE	TZ Mk. III	4	Various
GasLog Seattle	155,000	GasLog	Samsung	Oct-13	Bermuda	TFDE	TZ Mk. III	4	Various
GasLog Shanghai	155,000	GasLog	Samsung	Jan-13	Liberia	TFDE	TZ Mk. III	4	Various
Gaslog Singapore	155,000	GasLog	Samsung	Jul-10	Bermuda	DFDE	TZ Mk. III	4	Various
Gaslog Skagen	155,000	GasLog	Samsung	Oct-13	Bermuda	DFDE	TZ Mk. III	4	Various
Gaslog Sydney	155,000	GasLog	Samsung	May-13	Bermuda	DFDE	TZ Mk. III	4	Various
GDF-Suez Global Energy	74,000	Gaz de France	Chantiers	Dec-06	France	DFDE	CS1	4	Sonatrach
GDF-Suez Cape Ann	145,000	Hoegh LNG/MOL	Samsung	May-10	Liberia	DFDE	TZ Mk. III	4	Various
GDF-Suez Neptune	145,000	Hoegh LNG/MOL	Samsung	Dec-09	Liberia	DFDE	TZ Mk. III	4	Various
GDF-Suez Point Fortin	154,200	LNG Japan	Imabari/Koyo	Feb-10	Panama	DFDE	TZ Mk. III	4	Various
Gemmata	138,100	Shell Shipping	Mitsubishi Nagasaki	Mar-04	Singapore	S	Moss	5	Shell



Ghasha	137,510	National Gas Shipping	Mitsui	Jun-95	Liberia	S	Moss	5	ADGAS
Gigira Laitebo	177,000	MOL-Itochu	Hyundai	Feb-09	Panama	DFDE	TZ Mk. III	4	Various
Golar Arctic	140,645	Golar LNG	Daewoo	Dec-03	Marshall Is.	S	GT NO 96	4	Shell Spot
Golar Bear	160,000	Golar	Samsung	Mar-14	Bermuda	DFDE	TZ Mk. III	4	Various
Golar Celsius	160,000	Golar LNG	Samsung	Sep-13	Bermuda	DFDE	TZ Mk. III	4	Various
Golar Crystal	160,000	Golar LNG	Samsung	Oct-13	Bermuda	DFDE	TZ Mk. III	4	Various
Golar Eskimo (FSRU)	160,000	Golar LNG	Samsung	Jan-15	Bermuda	DFDE	TZ Mk. III	4	Various
Golar Freeze	125,850	Golar LNG	HDW	Feb-77	UK	S	Moss	5	Various
Golar Glacier	162,000	Golar LNG	Hyundai	Sep-14	Marshall Is.	DFDE	TZ Mk. III	4	Various
Golar Grand	145,880	Golar LNG	Daewoo	2006	IoM		GT NO 96	4	Various
Golar Ice	160,000	Golar LNG	Samsung	Feb-15	Bermuda	DFDE	TZ Mk. III	4	Various
Golar Igloo (FSRU)	160,000	Golar LNG	Samsung	Oct-13	Bermuda	DFDE	TZ Mk. III	4	Various
Golar Kelvin	160,000	Golar LNG	Samsung	Jan-15	Bermuda	DFDE	TZ Mk. III	4	Various
Golar Maria	145,950	Golar LNG	Daewoo	2006	Marshall Is.		GT NO 96	4	Various
Golar Mazo	135,225	Golar LNG/CPP	Mitsubishi	Jan-00	Liberia	S	Moss	5	Pertamina
Golar Penguin	160,000	Golar LNG	Samsung	Mar-14	Marshall Is.	DFDE	TZ Mk. III	4	Various
Golar Seal	160,000	Golar LNG	Samsung	Aug-13	Bermuda	DFDE	TZ Mk. III	4	Various
Golar Singapore (FSRU)	160,000	Golar LNG	Samsung	June-15	Bermuda	DFDE	TZ Mk. III	4	Various
Golar Snow	160,000	Golar LNG	Samsung	Jan-15	Bermuda	DFDE	TZ Mk. III	4	various
Golar Tundra (FSRU)	160,000	Golar LNG	Samsung	Dec-15	Bermuda	DFDE	TZ Mk. III	4	Various
Golar Viking	140,000	Golar LNG	Hyundai	Jan-05	Marshall Is.	S	Moss	4	Various
Golar Winter	138,250	Golar LNG	Daewoo	Apr-04	Marshall Is.	S	GT NO 96	4	Petrobras
Grace Acacia	150,000	Algaet Shipping	Hyundai	Jan-07	Japan	S	TK MK III	4	Various
Grace Barleria	150,000	Swallowtail Ship	Hyundai	Oct-07	Japan	S	TZ Mk. III	4	Various
Grace Cosmos	150,000	AGH Shipping	Hyundai	Mar-08	Japan	S	TZ Mk. III	4	Various
Grace Dahlia	177,000	Tokyo Gas	Kawasaki	Oct-13	Japan	S	Moss	4	Various
Gracilis	138,830	Golar LNG	Hyundai	Jan-05	Marshall Is.	S	TZ Mk. III	4	Shell BG
Granatina	140,645	Shell Shipping	Daewoo	Dec-03	Singapore	S	GT NO 96	4	Shell
Grand Aniva	147,200	Sovcomflot/NYK	Mitsubishi	Jan-08	Japan	S	Moss	4	Various
Grand Elena	147,200	Sovcomflot/NYK	Mitsubishi	Oct-07	Japan	S	Moss	4	Various
Grand Mereya	147,200	Primorsk/MOL/K Line	Chiba	May-08	Japan	S	Moss	4	Sakhalin II
Hanjin Muscat	138,200	Hanjin Shipping	Hanjin	Jul-99	Panama	S	GT NO 96	4	Oman Gas
Hanjin Pyeong Taek	130,600	Hanjin Shipping	Hanjin	Sep-95	Panama	S	GT NO 96	4	Pertamina
Hanjin Ras Laffan	138,214	Hanjin Shipping	Hanjin	Jul-00	Panama	S	GT NO 96	4	QatarGas
Hanjin Sur	138,333	Hanjin Shipping	Hanjin	Jan-00	Panama	S	GT NO 96	4	Oman Gas
Hispania Spirit	140,500	Teekay LNG Partners	Daewoo	Sep-02	Spain	S	GT NO 96	4	Atlantic LNG
Hoegh Gallant FSRU	170,050	Hoegh LNG	Hoegh Hyundai	May-14	Marshall Is.	DFDE	TZ Mk. III	4	chartered
Hoegh Grace FSRU	170,050	Hoegh LNG	Hoegh LNG Hyundai	May-15	Marshall Is.	DFDE	TZ Mk. III	4	various
Hyundai Aquapia	135,000	Hyundai MM	Hyundai	Mar-00	Panama	S	Moss	4	Oman Gas
Hyundai	135,000	Hyundai MM	Hyundai	Jan-00	Panama	S	Moss	4	RasGas
Hyundai Ecopia	145,000	Hyundai	Hyundai	Nov-08	Panama	S	TZ Mk. III	4	Various
Hyundai Greenpia	125,000	Hyundai MM	Hyundai	Nov-96	Panama	S	Moss	4	Pertamina
Hyundai Oceanpia	135,000	Hyundai MM	Hyundai	Jul-00	Panama	S	Moss	4	Oman Gas
Hyundai Technopia	135,000	Hyundai MM	Hyundai	Jul-00	Panama	S	Moss	4	RasGas
Hyundai Utopia	125,182	Hyundai MM	Hyundai	Jun-94	Panama	S	Moss	4	Pertamina
Iberica Knutsen	138,000	Knutsen OAS	Daewoo	Aug-06	Norway	S	GT 96	4	Gas Natural
Ibra LNG	147,100	Oman Gas	Samsung	Jun-06	Panama	S	TK Mk. III	4	Oman LNG
Ibri LNG	145,000	Oman Gas	Mitsubishi	Jul-06	Panama	S	TK Mk. III	4	Oman LNG
Ish	137,540	National Gas Shipping	Mitsubishi Nagasaki	Nov-95	Liberia	S	Moss	5	ADGAS
K Acacia	138,017	Korea Line	Daewoo	Jan-00	Panama	S	GT NO 96	4	Oman Gas
K Freesia	135,256	Korea Line	Daewoo	Jun-00	Panama	S	GT NO 96	4	RasGas
K Jasmine	145,700	Korea Line	Daewoo	Mar-08	Panama	S	GT NO 96	4	Kogas offtake
K Mugungwha	152,000	K Line	Daewoo	Nov-08	Panama	S	GT NO 96	4	Various
Kita LNG	160,106	TMSC Gas	Daewoo	Jun-14	Malta	TFDE	GT No 96	4	Various
Kotawaka Maru	125,200	J3 Consortium	Kawasaki Sakaide	Jan-84	Japan	S	Moss	5	Darwin
Kumul	172,000	MOL	Hudong	May-16	Hong Kong	DRL	GT NO. 96	4	PNG-Asia
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 Abalamabie	174 900	Bonny Gas	Samsung	Nov-16	Bermuda	DFDE	TZ Mk III	4	Nigeria LNG
LNG Abuja	126,530	Bonny Gas Transport	GD Quincy	Sep-80	Bahamas	S	Moss	5	Nigeria LNG
LNG Abuja II	174 900	Bonny Gas	Samsung	Oct 16	Bermuda	DFDE	TZ Mk III	4	Nigeria LNG
LNG Adamawa	141,000	Bonny Gas Transport	Hyundai	Jun-05	Bermuda	S	Moss	4	Various
LNG Akwa Ibom	141,000	Bonny Gas Transport	Hyundai	Nov-04	Bermuda	S	Moss	4	Various
LNG Aquarius	126,300	MOL/LNG Japan	GD Quincy	Jun-77	Marshall Is.	S	Moss	5	Various
LNG Barka	153,000	NYK	Kawasaki	Jan-09	Bahamas	S	Moss	4	Various
LNG Bayelsa	137,500	Bonny Gas Transport	Hyundai	Feb-03	Bermuda	S	Moss	4	Nigeria LNG
LNG Benue	145,700	BW Gas	Daewoo	Mar-06	Bermuda	S	GT NO 96	4	Nigeria LNG
LNG Bonny	177,000	Bonny Gas Transport	Hyundai	Oct-15	Bermuda	DFDE	TZ Mk III	4	Nigeria LNG
LNG Borno	149,600	NYK Line	Samsung	Aug-07	Japan	S	TZ Mk. III	4	Nigeria LNG
LNG Capricorn	126,300	MOL/LNG Japan	GD Quincy	Jun-78	Marshall Is.	S	Moss	5	Pertamina
LNG Cross River	141,000	Bonny Gas Transport	Hyundai	Sep-05	Bermuda	S	Moss	4	Various
LNG Dream	145,000	Osaka Gas	Kawasaki	Sep-06	Japan	S	Moss	4	Woodside Energy
LNG Ebisu	147,500	MOL	Kawasaki	Sep-08	Bahamas	S	Moss	4	Various
LNG Edo	126,530	Bonny Gas Transport	GD Quincy	May-80	Bahamas	S	Moss	5	Nigeria LNG
LNG Enugu	145,000	BW Gas	Daewoo	Oct-05	Bermuda	S	GT NO 96	4	Nigeria LNG
LNG Fimina	175,000	Bonny Gas Transport	Samsung	Oct-15	Bermuda	DFDE	TZ Mk III	4	Nigeria LNG
LNG Flora	127,700	J3 Consortium	Kawasaki Sakaide	Mar-93	Japan	S	Moss	4	Pertamina
LNG Fukurokuju	165,000	MOL	Kawasaki	June-15	Japan	S	Moss	4	Various
LNG Gemini	126,300	MOL/LNG Japan	GD Quincy	Sep-78	Marshall Is.	S	Moss	5	Pertamina
LNG Imo	148,300	BW Gas	Daewoo	Jun-08	Bermuda	S	GT NO 96	4	Nigeria LNG
LNG Jamal	135,330	Osaka Gas/J3 Consortium	Mitsubishi Nagasaki	Oct-00	Japan	S	Moss	5	Oman Gas
LNG Jupiter	145,000	NYK Line	Kawasaki	Jul-09	Bahamas	S	Moss	4	Various
LNG Jurojin	155,300	MOL	MHI Nagasaki	Nov-15	Japan	S	KM	4	Various
LNG Kano	148,471	BW Gas	Daewoo	Jan-07	Bermuda	S	GT No. 96	4	NLNG
LNG Lagos	177,000	Bonny Gas	Hyundai	Oct-15	Bermuda	DFDE	TZ Mk III	4	Nigeria LNG
LNG Leo	126,400	MOL/LNG Japan	GD Quincy	Dec-78	Marshall Is.	S	Moss	5	Pertamina
LNG Lerici	65,000	Exmar	Italcantieri Sestri	Mar-98	Italy	S	GT NO 96	4	Sonatrach
LNG Libra	126,400	Hoegh LNG	GD Quincy	Apr-79	Marshall Is.	S	Moss	5	Various
LNG Lokoja	148,300	BW Gas	Daewoo	Dec-06	Bermuda	S	GT No. 96	4	Nigeria LNG
LNG Mars	155,000	MOL/Osaka Gas	Mitsubishi	Oct-16	Marshall Is.	S	Moss	5	Various
LNG Ogun	148,300	NYK Line	Samsung	Aug-07	Japan	S	TZ Mk. III	4	Nigeria LNG



LNG Ondo	148,300	BW Gas	Daewoo	Sep-07	Bermuda	S	GT NO 96	4	Nigeria LNG
LNG Oyo	140,500	BW Gas	Daewoo	Dec-05	Bermuda	S	GT NO 96	4	Nigeria LNG
LNG Pioneer	138,000	MOL	Daewoo	Jul-05	Bahamas	S	GT No 96	4	Idku
LNG Port Harcourt	175,000	Bonny Gas	Samsung	Oct-15	Bermuda	DFDE	TZ Mk III	4	Nigeria LNG
LNG Portovenere	65,000	Exmar	Italcantieri Sestri	Jun-96	Italy	S	GT No 96	4	Sonatrach
LNG River Niger	141,000	Bonny Gas Transport	Hyundai	May-06	Bermuda	S	Moss	4	Various
LNG River Orashi	145,910	BW Gas	Daewoo	Nov-04	Bermuda	S	GT No 96	4	Nigeria LNG
LNG Rivers	137,231	Bonny Gas Transport	Hyundai	Jun-02	Bermuda	S	Moss	4	Nigeria LNG
LNG Saturn	153,000	MOL	MHI	Nov-15	Japan	S	Moss	4	Various
LNG Sokoto	137,231	Bonny Gas Transport	Hyundai	Aug-02	Bermuda	S	Moss	4	Nigeria LNG
LNG Taurus	126,300	MOL/LNG Japan	GD Quincy	Aug-79	Marshall Is.	S	Moss	5	Various
LNG Venus	155,000	Osaka/MOL	MHI	Oct-14	Japan	S	Moss	4	Various
LNG Vesta	127,547	Tokyo Gas Consortium	Mitsubishi Nagasaki	Jun-94	Japan	S	Moss	4	Pertamina
LNG Virgo	126,400	MOL/LNG Japan	GD Quincy	Dec-79	Marshall Is.	S	Moss	5	Pertamina
Lobito	160,400	Mitsui/NYK/Teekay	Samsung	Oct-11	Bahamas	DFDE	TZ Mk. III	4	Various
Lusail	138,000	Peninsular LNG	Samsung	May-05	Bahamas	S	TZ Mk. III	4	Qatar
Madrid Spirit	138,000	Teekay LNG Partners	IZAR Puerto Real	Jan-05	Spain	S	GT No 96	4	Engas
Magellan Spirit	165,500	Teekay LNG Partners	Samsung	Sep-08	Denmark	DFDE	TZ Mk. III	4	Various
Malanje	160,400	Mitsui/NYK/Teekay	Samsung	Jul-11	Bahamas	DFDE	TZ Mk. III	4	Various
Maran Gas Achilles	174,000	Maran	Hyundai Samho	Feb-16	Greece	DFDE	GT No 96	4	Various
Maran Gas Agamemnon	174,000	Maran	Hyundai Samho	May-16	Greece	DFDE	GT No 96	4	Various
Maran Gas Alexandria	161,870	Maran	Hyundai Samho	Sep-15	Greece	DFDE	TZ Mk. III	4	Various
Maran Gas Amphipolis	173,400	Maran	Daewoo	Aug-16	Greece	DFDE	GT No 96	4	Various
Maran Gas Apollonia	161,870	Maran	Daewoo	Jan-14	Greece	DFDE	GT No 96	4	Various
Maran Gas Asclepius	145,000	Kristen Navigation	Daewoo	Jul-05	Bermuda	S	GT No 96	4	Qatar
Maran Gas Coronis	145,700	Maran	Daewoo	Sep-07	Greece	S	GT No 96	4	Rasgas II
Maran Gas Delphi	159,800	Maran	Daewoo	Feb-14	Greece	DFDE	GT No 96	4	Various
Maran Gas Efessos	159,800	Maran	Daewoo	Jun-14	Greece	DFDE	GT No 96	4	Various
Maran Gas Hector	174,000	Maran	Hyundai Samho	Nov-16	Greece	DFDE	GT No 96	4	Various
Maran Gas Lindos	159,800	Maran	Daewoo	Jun-15	Greece	DFDE	GT No. 96	4	Various
Maran Gas Mystras	155,900	Maran Gas	Daewoo	May-15	Greece	DFDE	GT No 96	4	various
Maran Gas Pericles	174,000	Maran	Hyundai Samho	June-16	Greece	DFDE	GT No 96	4	Various
Maran Gas Posidonia	161,870	Maran	Daewoo	May-14	Greece	DFDE	GT No 96	4	Various
Maran Gas Roxana	173,400	Maran	Daewoo	Jan-17	Greece	DFDE	GT No 96	4	Various
Maran Gas Sparta	161,870	Maran	Hyundai Samho	April-15	Greece	DFDE	G TZ Mk. III	4	Various
Maran Gas Troy	155,900	Maran Gas	Daewoo	May-15	Greece	DFDE	GT No 96	4	various
Maran Gas Ulysses	174,000	Maran	Hyundai Samho	Jan-17	Greece	DFDE	GT No 96	4	Various
Maria Energy	174,000	Tsakos	Hyundai	Mar-15	Marshall Is.	TFDE	GTT Mk II	4	Various
Marib Spirit	165,000	Teekay LNG	Samsung	May-08	Marshall Is.	DFDE	TZ Mk. III	4	Various
Matthew	126,540	Suez LNG Shipping	Newport News	Jun-79	Bahamas	S	TZ Mk. I	6	Atlantic LNG
Mekaines	266,000	Nakilat	Samsung	Mar-09	Liberia	DRL	GT No 96	4	Qatar-Atlantic Basin
Meridian Spirit	165,500	Teekay LNG	Samsung	Jan-10	Denmark	DFDE	TZ Mk. III	4	Various
Mesaimeer	210,100	Nakilat	Hyundai	Mar-09	Liberia	DRL	GT No 96	4	Qatar-Atlantic Basin
Methane Alison Victoria	145,000	GasLog	Samsung	Aug-07	Bermuda	S	TZ III	4	Eq.Guinea LNG
Methane Becki Anne	170,000	GasLog	Samsung	Sep-10	Bermuda	TFDE	TZ Mk. III	4	Various
Methane Heather Sally	145,000	GasLog	Samsung	Jul-07	Bermuda	S	Tz Mk. III	4	Eq.Guinea LNG
Methane Jane Elizabeth	145,000	GasLog	Samsung	Jun-06	Bermuda	TFDE	TZ Mk. III	4	Engas
Methane Julia Louise	170,000	GasLog	Samsung	Dec-09	Bermuda	TFDE	TZ Mk. III	4	Various
Methane Kari Elin	138,200	Shell	Samsung	Jun-04	Bermuda	S	TZ Mk. III	4	Various
Methane Lake Charles	145,000	Shell	Samsung	Feb-07	Bermuda	S	TZ Mk. III	4	Marathon Oil
Methane Lydon Volney	145,000	Shell	Samsung	Aug-06	Bermuda	S	TZ Mk. III	4	Engas
Methane Mickie Harper	170,000	Shell-GasLog	Samsung	Nov-10	Bermuda	TFDE	TZ Mk. III	4	Various
Methane Nile Eagle	145,000	Shell-GasLog	Samsung	Dec-07	Bermuda	S	TZ Mk. III	4	Engas
Methane Patricia Camila	170,000	Shell-GasLog	Samsung	Oct-10	Bermuda	TFDE	TZ Mk. III	4	Various
Methane Princess	138,159	Golar LNG	Daewoo	2003	UK	S	GT No 96	4	Spot BG
Methane Rita Andre	145,000	GasLog	Samsung	Mar-06	Bermuda	S	TZ Mk. III	4	Engas
Methane Shirley Elizabeth	145,000	GasLog	Samsung	Apr-07	Bermuda	S	TZ Mk. III	4	Marathon Oil
Methane Sprit	165,000	Teekay LNG	Samsung	Mar-08	Singapore	DFDE	TZ Mk. III	4	Various
Milaha Qatar	145,000	Milaha	Samsung	Apr-06	Denmark	S	TZ Mk. III	4	Qatar
Milaha Ras Laffan	138,270	Milaha	Samsung	Mar-04	Denmark	S	TZ Mk. III	4	RasGas II
Min Lu	147,000	China Ships	Hudong	Aug-09	China	S	GT No 96	4	Various
Min Rong	147,000	China LNG Ships	Hudong	Feb-09	Hong Kong	S	GT No 96	4	Australia-China
Mourad Didouche	126,130	SNTM-Hyproc	Atlantique	Jul-80	Algeria	S	GT No 85	5	Sonatrach
Mozah	266,000	QGTC	Samsung	Aug-08	Qatar	DRL	TZ Mk III	5	Qatargas II
Mraweh	137,000	National Gas Shipping	Kvaerner-Masa	Jun-96	Liberia	S	Moss	4	ADGAS
Mubaraz	137,000	National Gas Shipping	Kvaerner-Masa	Jan-96	Liberia	S	Moss	4	Various
Muraq	210,100	J5-K Line	Daewoo	May-08	Marshall Is.	DRL	GT No 96	4	Qatar-Atl'c Basin
Murwab	210,100	J5 Consortium	Daewoo	May-08	Marshall Is.	DRL	GT No. 96	4	Qatargas
Muscat LNG	149,170	Oman Gas/MOL	Kawasaki Sakaide	Mar-04	Japan	S	Moss	4	Oman Gas
Neo Energy	149,700	Tsakos	Hyundai	Feb-07	Liberia	S	GTT Mk II	4	Various
Nizwah LNG	145,000	Oryx LNG Carriers	Kawasaki Sakaide	Dec-05	Japan	S	Moss	4	Oman Gas
Northwest Sanderling	127,525	Australia LNG	Mitsubishi Nagasaki	Jun-89	Australia	S	Moss	4	NWS
Northwest Sandpiper	127,500	Australia LNG	Mitsui Chiba	Feb-93	Australia	S	Moss	4	NWS
Northwest Seaeagle	127,450	Australia LNG	Mitsubishi Nagasaki	Nov-92	Bermuda	S	Moss	4	NWS
Northwest Shearwater	127,500	Australia LNG	Kawasaki Sakaide	Sep-91	Bermuda	S	Moss	4	NWS
Northwest Snipe	127,747	Australia LNG	Mitsui Chiba	Sep-90	Australia	S	Moss	4	NWS
Northwest Stormpetrel	127,600	Australia LNG	Mitsubishi Nagasaki	Dec-94	Australia	S	Moss	4	NWS
Northwest Swallow	127,708	J3 Consortium	Mitsui Chiba	Nov-89	Japan	S	Moss	4	NWS
Northwest Swan	138,000	Australia LNG	Daewoo	Mar-04	Australia	S	GT NO 96	4	NWS
Northwest Swift	127,590	J3 Consortium	Mitsubishi Nagasaki	Sep-89	Japan	S	Moss	4	NWS
Oak Spirit	173,400	Teekay	Daewoo	Jan-16	Bahamas	MEGI-DF	NO. 96 GW	4	Cheniere
Ob River	150,000	Lance Shipping	Hyundai	Oct-07	Marshall Is.	S	TZ Mk. III	4	Various
Onaiza	210,100	Nakilat	Daewoo	Apr-09	Liberia	DRL	GT NO 96	4	Qatar-Atlantic Basin
Pacific Arcadia	147,200	NYK Line	MHI	Oct-14	Bahamas	S	KM	4	Various
Pacific Enlighten	145,000	LNG MT	Mitsubishi	Mar-09	Japan	S	Moss	4	Various
Pacific Eurus	137,000	LNG Marine Transport	Mitsubishi Nagasaki	Mar-06	Bahamas	S	Moss	4	Darwin
Pacific Mimosa	155,300	NYK Line	MHI	Nov-17	Bahamas	S	Moss	4	Australia-Japan
Pacific Notus	137,006	Pacific LNG Shipping	Mitsubishi Nagasaki	Sep-03	Bahamas	S	Moss	5	Darwin
Palu LNG	160,106	TMSC Gas	Daewoo	Jun-14	Malta	TFDE	GT No 96	4	Various
Pan Asia	174,000	Teekay	Hudong-Zhonghua	July-17	Bahamas	TFDE	NO. 96 GW	4	Cheniere
Papua	171,800	MOL-China	Hudong	Jan-15	Hong Kong	DFDE	SSD	4	PNG LNG
Polar Eagle	89,880	Polar LNG	IHI Chita	Jun-93	Liberia	S	IHI SPB	4	ConocoPhillips/Marathon

CARRIER FLEET



Prachi	173,000	NYK-SCI	Hyundai	Nov-16	Singapore	TFDE	GT No 96	4	Petronet
Provalys	153,500	Gaz de France	Chantiers	Nov-06	France	DFDE	CS1	4	ELNG
Puteri Delima	130,400	MISC	Atlantique	Jan-95	Malaysia	S	GT NO 96	4	Petronas
Puteri Delima Satu	137,100	MISC	Mitsui Chiba	Apr-02	Malaysia	S	GT NO 96	4	Petronas
Puteri Firuz	130,400	MISC	Atlantique	May-97	Malaysia	S	GT NO 96	4	Petronas
Puteri Firuz Satu	137,100	MISC	Mitsubishi Nagasaki	Sep-04	Malaysia	S	GT NO 96	4	Petronas
Puteri Intan	130,400	MISC	Atlantique	Aug-94	Malaysia	S	GT NO 96	4	Petronas
Puteri Intan Satu	137,100	MISC	Mitsubishi Nagasaki	Dec-01	Malaysia	S	GT NO 96	4	Petronas
Puteri Mutiera Satu	137,100	MISC	Mitsui Chiba	Apr-05	Malaysia	S	GT NO 96	4	Petronas
Puteri Nilam	130,400	MISC	Atlantique	Jun-95	Malaysia	S	GT NO 96	4	Petronas
Puteri Nilam Satu	137,100	MISC	Mitsubishi Nagasaki	Sep-03	Malaysia	S	GT NO 96	4	Petronas
Puteri Zamrud	130,400	MISC	Atlantique	May-96	Malaysia	S	GT NO 96	4	Petronas
Puteri Zamrud Satu	137,100	MISC	Mitsui Chiba	Apr-87	Malaysia	S	GT NO 96	4	Atlantic LNG
Raahi	136,000	Petronet LNG Ltd	Daewoo	Dec-04	Malta	S	GT NO 96	4	Qatargas
Ramdane Abane	126,130	SNTM-Hyproc	Atlantique	Jul-81	Algeria	S	GT NO 85	5	Sonatrach
Rasheeda	266,000	QGTC	Samsung	Jun-10	Liberia	DRL	TZ Mk. III		Various
Ribera del Duero Knutsen	173,400	Knutsen	Daewoo	Nov-10	Nor-NIS	DFDE	GT NO. 96	4	Various
Rioja Knutsen	176,300	Knutsen	Daewoo	Dec-16	Nor-NIS	DFDE	TZ Mk III	4	Various
Salalah LNG	147,000	Oman Gas/MOL	Samsung	Dec-05	Japan	S	TZ Mk. III	4	Oman
SCF Polar	71,500	Sovcomflot	Kockums	Aug-69	Liberia	S	GT NO 82	6	Sonatrach
Seishu Maru	162,000	K Line-Transpacific	Kawasaki Sakaide	Jan-15	Panama	S	Moss	4	Australia-Japan
Seri Alam	138,000	MISC	Samsung	Oct-05	Malaysia	S	TZ Mk. III	4	Yemen LNG
Seri Amanah	145,000	MISC	Samsung	Mar-06	Malaysia	S	TZ Mk. III	4	Yemen LNG
Seri Anggun	145,000	MISC	Samsung	Nov-06	Malaysia	S	TZ Mk. III	4	Yemen LNG
Seri Angkasa	145,000	MISC	Samsung	Feb-07	Malaysia	S	TZ Mk. III	4	Petronas
Seri Ayu	145,000	MISC	Samsung	Oct-07	Malaysia	S	TZ Mk. III	4	Various
Seri Bakti	152,300	MISC	Mitsubishi	Mar-07	Malaysia	S	GT NO 96	4	Petronas
Seri Balhaf	152,000	MISC	Mitsubishi	Sep-08	Malaysia	S	GT NO 96	4	Various
Seri Balquis	152,000	MISC	Mitsubishi	Dec-08	Malaysia	S	GT NO 96	4	Various
Seri Begawan	152,300	MISC	Mitsubishi	Dec-07	Malaysia	S	GT NO 96	4	Various
Seri Bijaksana	152,300	MISC	Mitsubishi	Feb-08	Malaysia	S	GT NO 96	4	Petronas
Seri Camellia	150,000	MISC	Hyundai	Nov-16	Malaysia	S	Moss	5	Petronas
Seri Cenderawasih	150,000	MISC	Hyundai	Jan-17	Malaysia	S	Moss	5	Petronas
Sestao Knutsen	138,000	Knutsen	IZAR Sestao	Jan-07	Spain	S	GT NO 96	4	Atlantic LNG
Sevilla Knutsen	173,400	Knutsen	Daewoo	Jun-10	N.I.S.	DFDE	GT NO 96	4	Various
Shahamah	135,500	National Gas Shipping	Kawasaki Sakaide	Oct-94	Liberia	S	Moss	5	ADGAS
Shangra	266,000	QGTC	Samsung	Nov-09	Liberia	DRL	TZ Mk. III	5	Qatargas IV
Shen Hai	147,100	China LNG	Hudong Zhonghua	Sep-12	China	AB/CC Steam	GT NO 96	4	Various
Simaisma	147,700	Maran Gas Maritime	Daewoo	Jul-06	Greece	S	GT No 96	4	Qatar
SK Splendor	138,375	SK Shipping	Samsung	Mar-00	Panama	S	TZ Mk. III	4	Oman Gas
SK Stellar	138,375	SK Shipping	Samsung	Dec-00	Panama	S	TZ Mk. III	4	RasGas
SK Summit	138,000	SK Shipping	Daewoo	Aug-99	Panama	S	GT NO 96	4	RasGas
SK Sunrise	138,306	I. S. Carriers	Samsung	Sep-03	Panama	S	TZ Mk. III	4	RasGas
SK Supreme	138,200	SK Shipping	Samsung	Jan-00	Panama	S	TZ Mk. III	4	RasGas
Sohar LNG	137,250	Oman Gas/ MOL	Mitsubishi Nagasaki	Oct-01	Malta	S	Moss	5	Oman Gas
Solaris	155,000	GasLog	Samsung	Jul-14	Bermuda	TFDE	TZ Mk. III	4	Various
Sonangol Benguela	160,500	Sonangol	Daewoo	Sep-11	Bahamas	S	GT No. 96	4	Angola LNG
Sonangol Etosha	160,500	Sonangol	Daewoo	Sep-11	Bahamas	S	GT No. 96	4	Angola LNG
Sonangol Sambizanga	160,500	Sonangol	Daewoo	Sep-11	Bahamas	S	GT No. 96	4	Angola LNG
Southern Cross	172,000	MOL	Hudong	May-15	Hong Kong	DRL	GT NO. 96	4	Various
Soyo	160,400	Mitsui/NYK/Teekay	Samsung	May-11	Bahamas	DFDE	TZ Mk. III	4	Various
Spirit of Hela	177,000	MOL	Hyundai	Oct-09	Panama	DFDE	TZ Mk. III	4	Various
Stena Blue Sky	145,700	Stena	Daewoo	Jan-06	Panama	S	GT No 96	4	Various
Stena Clear Sky	171,800	Stena	Daewoo	Sep-10	Panama	DFDE	GT NO 96	4	Various
Stena Crystal Sky	171,800	Stena	Daewoo	Jul-10	Panama	DFDE	GT NO 96	4	Various
STX Kolt	145,700	STX Panocean	Korea Hanjin	Nov-08	Panama	DFDE	TZ Mk. III	4	Various
Suez Point Fortin	154,200	Trinity LNG	Koyo Japan	Nov-09	Panama	S	TZ Mk. III	4	Yemen LNG
Taitar No. 1	145,000	NYK Line	Mitsubishi	Oct-09	Liberia	S	Moss	4	Various
Taitar No. 3	145,000	NYK Line	Mitsubishi	Jan-10	Liberia	S	Moss	4	Various
Taitar No. 4	145,000	NYK	Mitsubishi	Jan-10	Liberia	S	Moss	4	Various
Tangguh Batur	145,700	Sovcomflot/NYK	Daewoo	Dec-08	Cyprus	S	GT NO 96		Tangguh
Tangguh Foja	155,000	K Line	Samsung	Jul-08	Panama	DFDE	TZ Mk. III	4	Tangguh LNG
Tangguh Hiri	155,000	Teekay LNG	Hyundai	Nov-08	IOM	DFDE	TZ Mk. III	4	Tangguh
Tangguh Jaya	145,700	K Line	Samsung	Nov-08	Panama	DFDE	TZ Mk. III	4	Tangguh
Tangguh Palung	155,000	K Line	Samsung	Mar-09	Panama	DFDE	TZ Mk. III	4	Tangguh
Tangguh Sago	155,000	Teekay LNG	Hyundai	Mar-09	IOM	DFDE	TZ Mk. III	4	Tangguh LNG
Tangguh Towuti	145,700	Sovcomflot/NYK	Daewoo	Oct-08	Cyprus	S	GT NO 96	4	Tangguh
Tembek	216,200	OSG/Nakilat	Samsung	Sep-07	Marshall Is.	DRL	TZ Mk. III	4	Qatargas II
Tenaga Satu	130,000	MISC	Dunkerque	Sep-82	Malaysia	S	GT NO 88	5	Petronas
Torben Spirit	173,000	Teekay	Daewoo	Feb-17	Bahama	MEGI-DF	No 96 GW	4	Various
Trinity Arrow	154,900	K Line	Imabari Shipbuilding	Mar-08	Panama	S	TZ Mk. III	4	Various
Umm Al Amad	210,100	J5	Daewoo	Aug-08	Marshall Is.	DRL	GT NO 96	4	Ras Gas III
Umm Al Ashtan	137,000	National Gas Shipping	Kvaerner- Masa	May-97	Liberia	S	Moss	4	ADGAS
Umm Bab	145,000	Kristen Navigation	Daewoo	Nov-05	Bermuda	S	GT NO 96	4	Qatargas
Umm Slaal	266,000	QGTC	Samsung	Nov-08	Qatar	DRL	TZ Mk. III	5	Qatargas
Valencia Knutsen	173,400	Knutsen	Daewoo	Sep-10	Nor-NIS	DFDE	GT NO. 96	4	Various
Velikiy Novgorod	170,200	SovComFlot	STX	Feb-14	Liberia	DFDE	GT No. 96	4	Various
Wakaba Maru	125,000	J3 Consortium	Mitsui Chiba	Apr-85	Japan	S	Moss	5	Pertamina
WilEnergy	125,500	Awilco LNG	Mitsubishi	Oct-83	NIS	S	Moss	5	Various
WilForce	156,000	Teekay LNG	Daewoo	Aug-13	NIS	DFDE	GT NO 96	4	Various
WilGas	125,500	Awilco LNG	Mitsubishi	Jul-84	NIS	S	Moss	5	Various
WilPower	125,500	Awilco LNG	Mitsubishi	Jul-84	NIS	S	Moss	5	Various
Woodside Cheney	174,000	Maran	Hyundai Samho	March-16	Greece	DFDE	GT No 96	4	Various
Woodside Donaldson	165,500	Teekay LNG	Samsung	Dec-09	Singapore	DFDE	TZ Mk. III	4	Various
Woodside Goode	159,800	Maran	Daewoo	Jul-14	Greece	DFDE	GT No. 96	4	Various
Woodside Reeswithers	173,400	Maran	Daewoo	Nov-16	Greece	DFDE	GT No 96	4	Various
Woodside Rogers	155,900	Maran Gas	DSME	Jul-13	Greece	DFDE	GT NO 96	4	Various
Yari LNG	159,983	TMSC Gas	Daewoo	Jun-14	Malta	TFDE	GT No 96	4	Various
Yenisei River	155,000	Dynagas	Hyundai	Jul-13	Marshall Is.	DFDE	TZ Mk. III	4	Various
YK Sovereign	127,125	SK Shipping	Hyundai	Dec-94	Panama	S	Moss	4	Pertamina
Zarga	266,000	QGTC	Samsung	Dec-09	Liberia	DRL	TZ Mk. III	5	Qatar-Atlantic
Zekreet	135,420	J4 Consortium	Mitsui Chiba	Dec-98	Japan	S	Moss	5	Qatargas

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

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](mailto:John.McKay@lngjournal.com) 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	4	640,000
	Dalian	PetroChina	2011	3	480,000
	Dongguan, Guangdong	Jovo Group	2013	2	160,000
	Fujian LNG (Xiuyu)	CNOOC, Fujian I&D Corp.	2008	2	640,000
	Guangdong	CNOOC, BP	2006	3	480,000
	Haikou, Hainan LNG	CNOOC	2014	3	480,000
	Ningbo, Zhejiang	CNOOC, Zhejiang Energy	2012	3	480,000
	Qingdao, Shandong	Sinopec	2014	3	480,000
	Rudong	PetroChina	2011	3	530,000
	Shanghai	CNOOC, Shenergy Group	2009	3	495,000
	Shanghai, Mengtougou	Shanghai Gas	2008	3	120,000
	Shenzen, Diefu	CNOOC	2016	2	320,000
	Tangshan, Hebei	PetroChina	2013	3	480,000
	Tianjin North	Sinopec	2017	2	320,000
	Yuedong, Guangdong	CNOOC	2016	2	320,000
	Zhuhai, Gaolan	CNOOC	2013	3	480,000
Dominican Republic	Punta Caucedo	AES Andres	2003	1	160,000
Finland	Pori	Gasum Skangas	2016	1	30,000
France	Fos Tonkin	Elengy	1972	3	150,000
	Montoir-de-Bretagne	Elengy	1980	3	360,000
	Fos Cavaou	Engie, Total	2010	3	330,000
	Dunkirk LNG	EDF, Fluxys, Total	2016	3	570,000
Greece	Revithoussa	DEPA	2000	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	3	600,000
	Senboku I	Osaka Gas	1972	4	180,000
	Senboku II	Osaka Gas	1977	18	1,585,000
	Himeji	Osaka Gas	1984	8	740,000
	Himeji LNG	Kansai Electric	1979	7	520,000
	Yanai	Chugoku Electric	1990	6	480,000
	Niigata	Nihonkai LNG, Tohoku Electric	1984	8	720,000
	Oita	Oita Gas, Kyushu Electric	1990	5	460,000
	Tobata	Kitakyushu LNG	1977	8	480,000
	Fukuoka	Saibu Gas	1993	2	70,000
	Sodeshi	Shizuoka Gas	1996	3	337,200
	Hatsukaichi	Hiroshima Gas	1996	2	170,000
	Kagoshima	Nippon Gas	1996	2	136,000
	Shin-Minato	Sendai City Gas	1997	1	80,000
	Nagasaki	Saibu Gas	2003	1	36,000
	Sakai	Kansai Electric, Cosmo Oil	2006	3	420,000
	Mizushima	Nippon Oil, Chugoku Electric	2006	2	320,000
	Sakaide	Shikoku Electric, Cosmo Oil	2011	1	180,000
	Ishikari LNG	Hokkaido Gas, Hokkaido Electric	2012	2	380,000
	Okinawa	Okinawa Electric Power	2012	2	280,000
	Naoetsu	Inpex	2013	2	360,000
	Joetsu	Chubu	2011	3	540,000
	Hachinohe LNG	Nippon Oil	2015	2	280,000
	Hitachi LNG	Tokyo Gas	2015	1	230,000
	Soma Fukushima	Japan Petroleum Exploration	2017	1	225,000
Korea	Boryeong	GS Energy, SK E&S	2017	3	200,000
	Incheon	Kogas	1996	20	2,880,000
	Kwangyang	POSCO	2005	4	530,000
	Pyeong-Taek	Kogas	1986	23	3,360,000
	Samcheok	Kogas	2014	3	600,000
	Tong-Yeong	Kogas	2002	17	2,620,000
Malaysia	Pengerang Johor	Petronas Gas	2017	2	400,000
Mexico	Altamira	Vopak, Enagas	2006	2	300,000
	Energia Costa Azul	Sempre LNG	2008	2	320,000
	Manzanillo	Samsung, Kogas, Mitsui	2012	2	300,000

LNG Import Terminals (continued)

Country	Location (Project)	Owners	Start up	Storage	
				Tanks	Capacity
Netherlands	Gate LNG	Gasunie, Royal Vopak	2011	3	540,000
Poland	Swinoujscie	Baltic Gaz System	2015	2	320,000
Portugal	Sines	REN Atlantico	2004	3	390,000
Puerto Rico	Penuelas	EcoElectrica	2000	1	160,000
Singapore	Singapore	Singapore Energy Authority	2013	3	540,000
Spain	Barcelona	Enagas	1969	8	840,000
	Huelva	Enagas	1988	5	610,000
	Cartagena	Enagas	1989	5	587,000
	Bilbao	Enagas, EVE	2003	3	450,000
	Sagunto	GNF, Osaka Gas, Oman Oil	2006	4	600,000
	Reganosa, Ferrol	Galicia, Sonatrach, Tojeiro	2006	2	300,000
	El Musel, Gijón,	Enagas	2013	2	300,000
Taiwan	Yung-An	CPC	1990	6	690,000
	Tai-Chung	CPC	2009	3	480,000
Thailand	Map Ta Phut	PTT LNG	2011	2	320,000
Turkey	Marmara Ereglisi	Botas	1994	3	255,000
	Izmir	EgeGaz	2006	2	280,000
USA	Everett	Suez LNG NA	1971	2	155,000
	Lake Charles	Shell, ETE	1982	4	425,000
	Elba Island	Kinder	2001	5	535,000
	Cove Point	Dominion	2003	5	530,000
	Freeport	Freeport LNG Development	2008	2	320,000
	Cameron	Sempra LNG	2009	3	480,000
	Golden Pass, TX	Qatar Petroleum, ExxonMobil	2010	5	775,000
	Pascagoula, MS	Gulf LNG, Kinder	2012	2	320,000
UK	Isle of Grain	National Grid	2005	8	1,000,000
	South Hook	ExxonMobil, Qatar Petroleum, Total	2009	5	775,000
	Dragon LNG, Milford Haven	Shell, Petronas	2009	2	310,000

LNG Import Terminal Projects

Country	Location/Project	Owners/Project Developers	Start up	Storage	
				Tanks	Capacity
China	Zhoushan Zhejiang	Enn Group	2018	2	320,000
Finland	Tornio	Gasum Skanga	2018	1	30,000
Gibraltar	Gasnor	Shell	2017	1	5,000
India	Ennore	Indian Oil Corp	2018	2	320,000
	Mundra	Gujarat State Petroleum, Adani Group	2018	2	320,000
	FSRU Andhra Pradesh	Engie, Andhra Pradesh Gas	2018	1	135,000
	Pipovav LNG (FSRU), Gujarat	Swan Energy	2018	2	320,000
	Andhra Pradesh	Hindustan LNG, Andhra Pradesh	studies	1	135,000
Indonesia	Labuhan Maringgai	Perusahaan Gas Negara	2018	1	135,000
Malaysia	Lahad Datu LNG, Sabah	Petronas	2018	studies	
Panama	Costa Norte	AES	2018	1	130,000
Philippines	Pagbilao LNG	Energy World Corp.	2017	1	130,000
UK	Port Meridian, Barrow-in-Furness	Port Meridian Energy Ltd.	2018	1	150,000
Uruguay FSRU	Montevideo	Gas Sayago, Mitsui Osk Lines	2018	1	230,000

LNG FSRU Import Facilities

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

LNG Export Projects

Country	Location/Project	Project Developers	Planned Start Up	Number of Trains	Capacity In MTPA
AUSTRALIA	Browse LNG	Woodside, BHP, BP Chevron, Shell, Mitsubishi, Mitsui	2021+	2	10.0
	Ichthys LNG	INPEX, Total	2017	2	8.4
	Prelude FLNG	Shell, Inpex, Kogas CPC	2018	1	3.5
CANADA	Bear Head LNG, Nova Scotia	LNG Ltd.	2024	4	8.0
	GNL Quebec, Saquenay	Freestone Capital and Breyer Capital	2024	4	10.0
	Goldboro LNG, Nova Scotia	Pieridae Energy	2024	2	10.0
	Kitimat LNG, BC	Woodside, Chevron	2024	2	10.0
	LNG Canada, BC	Shell, Mitsubishi, Kogas, PetroChina	2024	2	12.0
	Melford LNG project, Nova Scotia	H-Energy Hiranandani Group	Studies		
	Steelhead LNG, Bamfield	Steelhead LNG Corp	2021	2	12.00
	Vancouver Tilbury	WesPac Midstream	2021	1	3.25
	Woodfibre LNG, Squamish	Pacific Oil & Gas Co	2020	2	2.1
EQ.GUINEA	Equatorial Guinea Fortuna FLNG	Ophir, Golar LNG, Schlumberger, GEPetrol	2019	1	2.0
INDONESIA	Sengkang LNG	Energy World Corp.	2017	4	2.0
MALAYSIA	Rotan FLNG (Sabah)	Petronas, Murphy Oil	2019	1	1.5
MOZAMBIQUE	Area 1 Onshore	Anadarko Petroleum and partners	2021	2	10
	Area 4 Onshore	Eni and partners	2021	2	10
	Area 4 FLNG	Eni and partners	2019	1	2.5
NIGERIA	NLNG Train 7	NNPC, Shell, BP, Total	2020+	1	8.4
PAPUA NEW GUINEA	Elk-Antelope LNG	Total, ExxonMobil Oil Search, Petromin	Studies		
RUSSIA	Sakhalin II expansion	Gazprom, Shell, Mitsui, Mitsubishi	2021	studies	
	Vladisvostok LNG	Gazprom, Itochu, various	2021	2	10.0
USA	Alaska LNG Nikiski	Alaska Gasline Development Corp.	2022	3	20.0
	Annova LNG, Brownsville	Exelon Corp.	2021	6	6.0
	Cameron LNG, Louisiana	Sempra	2018	5	24.92
	Commonwealth LNG, Louisiana	Commonwealth LNG LLP	2022	8	9.0
	Corpus Christi Liquefaction, Texas	Cheniere	2019	5	22.5
	Delfin LNG, Louisiana	Delfin, Hoegh	2021	3	9.0
	Driftwood LNG, Louisiana	Tellurian Investments	2022	6	26.0
	Elba Island, Georgia	Kinder Morgan, EIG Energy	2018	10	2.5
	Freeport LNG, Texas	Freeport LNG	2018	4	20.4
	Golden Pass, Texas	Qatar Petroleum, ExxonMobil	2021	3	15.6
	Jordan Cove, Coos Bay	Pembina Corp.	2024	2	7.8
	Lake Charles, Louisiana	Shell, ETE	2024	3	15.0
	Magnolia LNG	Louisiana LNG Ltd.	2021	4	8.0
	Port Arthur LNG	Sempra	2021	2	10.0
	Rio Grande LNG	NextDecade	2021	6	27.0
	Sabine Pass LNG, Louisiana	Cheniere	2018-19	2	9.0
	Texas LNG Brownsville	Chandra, Meyer, Samsung, others	2021	2	4.0
	VG LNG (Cameron Parish)	Venture Global	2021	5	10.0
	VG LNG (Plaquemines)	Venture Global	2021	10	20.0

LNG Exporters

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

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