LNG journal
The World's Leading LNG publication
40 pages essential LNG news!
March 2020

## In this issue:



# Final LNG and economic and human impact of coronavirus is still unclear

*Australia is a main supplier to the Chinese, shipping about 40 cargoes a month*

The final economic and human impact of China's coronavirus outbreak on LNG markets and citizens around the world may become clearer in several more weeks as activity in key manufacturing hubs struggles to rebound, keeping a lid on natural gas demand and triggering more trade flow disruptions.

Restrictions were still preventing millions of workers from returning to work and factories expected only partial production restarts, with some delaying a return to operations until early March.


**Terminal workers at the Sinopec import facility at Tianjin Port in northeast China. Some of the 20 terminals had full storage capacity**

## Spectre

This has raised the spectre of more Chinese LNG importers reneging on supply contracts, and suppliers expressing concerns about more cargo cancellations after state-run China National Offshore Oil Corp., the nation's largest LNG importer, declared "force majeure" in February.

A growing number of LNG suppliers, including commodities trading firms and national oil companies in the Middle East and elsewhere, had received notifications in which the effects of the coronavirus were cited.

CNOOC is the owner of nine Chinese LNG import terminals and has multiple oil and gas stakes.

The Chinese major's future project stakes include the Arctic II LNG joint venture led by Novatek of Russia.

CNOOC also receives regular LNG shipments from facilities in Indonesia and in Western and Eastern Australia.

## Diversions

China imported a record 61 million tonnes of LNG during 2019, a 13.5 percent increase on the previous year and consolidated its position as the No. 2 importer after Japan and ahead of South Korea.

However, since the coronavirus outbreak some cargoes have been diverted and lawyers argue that simply declaring "force majeure" is not a straight forward procedure. It still has to have a contractual base.

Analysts have said that in addition to port workers being told to stay at home, China's 20 LNG import terminal already had high storage levels.

This is because China like the other Northern Hemisphere countries had mild winter weather and much lower demand than expected for natural gas.

China receives more than 5MT per month of shipments from a diverse list of nations such as Australia, Qatar, Malaysia, Indonesia and Papua New Guinea as well as spot cargoes from West Africa and elsewhere.

Chinese LNG sourcing has diversified as it needs have grown. Imports increased by 38 percent in 2018 to 53.81MT compared with just over 39MT in 2017.

Since the beginning of February, about 20 LNG vessels, initially expected to deliver their cargoes to China or other Far East ports, have been diverted, according to shipping data.

Lawyers have said that the ability of a Chinese buyer to seek "force majeure" protection depends on the LNG contracts, and defining this in the current market was complicated as not all events trigger a "force majeure".

## Testing

That said most LNG Sale and Purchase Agreement have a non-exhaustive list of events, which provided they satisfy the general test, are capable of being "force majeure".

Contracts also exclude certain events from being "force majeure", such as the inability of a party to pay or a breach of law, or even changes in downstream markets and reduced gas demand.

French energy major Total said at its post-earnings conference earlier in February 2020 that there was a strong temptation from some long-term customers to use "force majeure" to reject cargoes under long-term contracts, while still purchasing spot cargoes at lower prices.

The China Council for the Promotion of International Trade, which promotes foreign trade and investment, recently issued "force majeure" certificates to local companies to protect them from the commercial fallout of the coronavirus outbreak.

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Some lawyers pointed out that a notice by an authority supporting the buyer's claim may not be sufficient by itself. It will depend on the facts and the provisions of the LNG SPA.

## Affected

They explained that the affected party would typically need to comply with provisions like taking reasonable measures to minimize the effects of "force majeure", and even if the buyer is not entitled to "force majeure" it may have rights to divert cargoes to other markets or reduce offtake quantities.

Australia is a main supplier to China and was watching the situation closely.

Shipments in January 2020 numbered 103 cargoes and 41 were unloaded in China compared with 35 in December 2019, so were not affected by the surplus of LNG globally nor by the disruption to trade from the coronavirus.

There were still signs that some disruption could be expected in late February and early March.

Total Australian LNG shipments in January were 7.0MT, slightly lower than the record 7.1MT (104 cargoes) in December 2019.

According to Australian consultants EnergyQuest there was potential for delays in cargoes.

## Delays

There were reports of Chinese buyers delaying spot cargoes, re-selling some February and March cargoes, and potentially delaying their term off-take.

> *"Inventories were also rapidly building ... owing to a sharp decrease in gas demand, as well as the warm winter temperatures"*

"After an already warmer-than-average winter, weak local demand has led to higher inventories at several Chinese LNG terminals," said the consultants.

"This has in turn led to several cargoes being delayed in discharging, and in some cases the cargoes being offered elsewhere on a prompt basis," they added.

China is the second-largest buyer of Australian LNG. In January, 36 percent of Australian exports went to China, just behind volumes purchased by Japan.

The East Coast plants in Queensland are most exposed to the China trade.

## China portion

The percentage of output delivered to China in January was 85 percent for Australia-Pacific LNG and 67 percent for the Royal Dutch Shell-operated Queensland Curtis LNG facility.

Most other projects also have significant exposure to Chinese buyers: Pluto LNG 42 percent, Gorgon 38 percent, Ichthys 27 percent, NWS 26 percent, Darwin 24 percent, GLNG 24 percent.

The Chevron-operated Wheatstone plant only supplies about 9 percent of its cargoes to China.

"Inventories were also rapidly building at receiving terminals owing to a sharp decrease in gas demand, as well as the warm winter temperatures," said the report.

Hence, receiving terminals did not have enough space to take new cargoes such as those PetroChina has on contract from the Chevron-operated Gorgon plant on Barrow Island in Western Australia.

"CNOOC has contracts with QCLNG. Sinopec has also indicated it is considering the declaration of 'force majeure' but has not yet done so," it added.

## Screening

At the Australian end, health screening on ship crews arriving from China has been upgraded but the Australian government has apparently said that no restrictions will come in the way of regular operations of LNG ships loading cargoes.

"This is a rapidly evolving situation but one which could have national economic impacts. The East Coast gas market will also be affected if cargoes are delayed and significant gas volumes have to be diverted to the domestic market," stated EnergyQuest.

The report explained that even if all of the Chinese state-owned companies declared "force majeure", they are unlikely to stop taking the entire term volume.

Captain Rajesh Unni, Chief Executive of Singapore-headquartered Synergy Group, one of the world's leading ship managers, commented: "Seafarers are working under tremendous pressure and doing an amazing job keeping world trade moving. But many are, understandably, anxious about when they can see families again because of restrictions on crew changes and quarantine periods being enforced on arrival at some countries."

The deadly virus has seen severe restrictions put in place on seafarers calling at ports across the Asia Pacific region.

Crew manning the world's commercial fleet of tankers, commodity-carrying bulk carriers and container ships are not allowed to leave vessels when calling at ports in China, the epicentre of the virus.

Restrictions preventing crew leaving the ship or denying seafarers access to a visa-on-arrival are also in place at a range of countries including Singapore, Indonesia, Malaysia, Philippines, Russia, Australia and South Korea.

The Australian report admitted that it was unclear how much the LNG cargo intake would be reduced, and its timing.

Prices have plunged to US$2.90-US$3.20 per million British thermal units for deliveries in the second half of March and US$2.75-3.05 per MMBtu for May deliveries.

"A couple of Chinese end-users reported that while port closures had not been put in place for most of the country, there were other circumstances under which they could declare 'force majeure' - regional quarantines could result in companies not being able to receive or transit goods, for example," said the report.

"Chinese buyers pointed out that this move could provide some relief to end-users who had been struggling with high inventories even before the coronavirus outbreak," it added.

The Australian January shipments amounted to 82.2 MTPA on an annualised basis, well above Qatar's nameplate capacity of 77 MTPA, making Australia the largest global exporter. ■

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# Small-scale LNG has important role to play in helping provide power and clean energy

*Despite the advantages there was still uncertainty as to the durability of demand in new markets*

Liquefied natural gas overtakes pipeline natural gas as the main way of trading gas over long distances by the late 2020s.

That's according to the Stated Policies Scenario of the annual report from the International Energy Agency.

"Developing economies in Asia are the main engines of LNG growth, with the market share of LNG in total gas demand growing from 20 percent in 2018 to 40 percent by 2040," said the IEA.

## Scale

However, the IEA noted that there was significant uncertainty as to the scale and the durability of demand for imported LNG in developing markets around the world.

The price sensitivity of demand is one key uncertainty: another is the extent of competition from other fuels and technologies, whether in the form of coal or renewables. LNG is a relatively high-cost fuel, with investment in liquefaction, transportation and regasification adding significantly to the cost of the gas itself.

"Emerging markets in Asia are facing significantly higher costs for imports than for domestically produced gas," said the IEA report.

"Even though spot gas prices fell to record lows in 2019 on the back of ample LNG supplies, over the long-term end-user prices generally seem set to rise," it added.

## Interest

"Unless they do, LNG suppliers will be unable to recover their long-term investment costs or governments will have to continue to subsidise the cost of LNG imports," explained the report.

"The LNG industry faces a struggle to gain a strong foothold in developing markets where affordability is a key consideration," it stated.

In recent years, there has been growing interest in the potential for small-scale LNG to unlock new markets and applications for natural gas.

Small-scale LNG refers to the use of LNG as a liquid fuel in a number of niche applications for which pipeline gas is unsuitable.

Close to 30 million tonnes per annum of small-scale LNG capacity is estimated to be in place, with the vast majority in China.

"Small-scale LNG has potential uses as a marine fuel for ships and bunkers, as a liquid fuel for trucks and rail, and as a fuel for use in remote locations that are not served by gas infrastructure," explained the IEA.

LNG deliveries on a small scale also provide an opportunity to underpin a broader transition to natural gas by building new customer bases for the use of LNG that in time could justify the construction of large-scale pipeline infrastructure.

"The use of small-scale LNG in various forms is growing in a number of places," said the report.

## Europe

"In Europe, regasification facility operators have doubled the number of LNG truck-loading services and tripled the number of bunkering facilities over the last five years," it added.

"More than three-quarters of European regasification terminals now possess truck-loading capabilities, and this has encouraged the expansion of associated infrastructure such as refuelling stations," stated the report.

The IEA also noted that China has quickly developed LNG transportation infrastructure in the form of both trucks and inland bunkering facilities.

"There are now nearly 300,000 LNG-fuelled trucks in China, a ten-fold increase in four years," said the IEA.

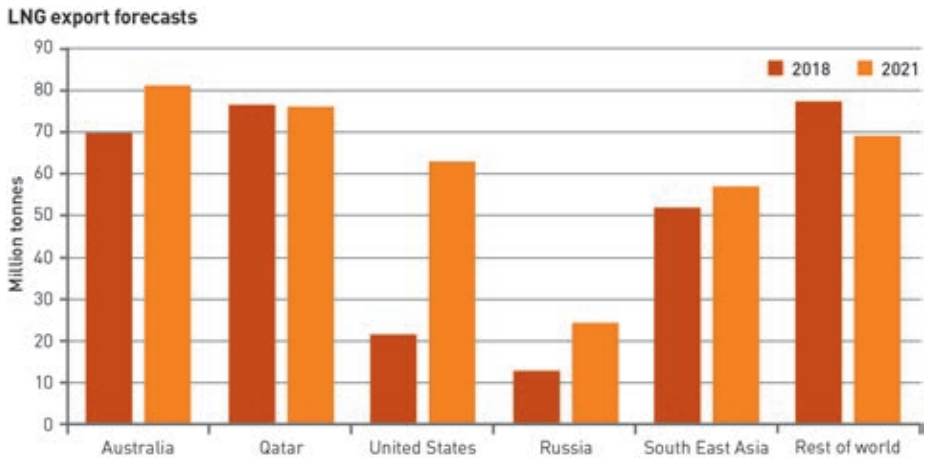
"Nearly 25 million tonnes of small-scale LNG was delivered in China in 2018 (accounting for around 50 percent of total Chinese LNG demand), around half of which was sourced from regasification terminals and the rest from small-scale inland liquefaction facilities," it explained.

## Chains

Elsewhere in the world, developing supply chains for small-scale LNG is more challenging, but the potential is high.

The costs of small-scale LNG lie in a relatively wide range of $2.5 per million British thermal units and 8.5 per MMBtu, and largely depend on the presence of existing LNG infrastructure, in particular LNG liquefaction or regasification terminals with truck-loading capabilities.

Receiving terminals would need to be either FSRUs or otherwise offer "break bulk" capabilities, which could parcel out smaller quantities for local industrial demand.




**LNG export forecasts from now through to 2021 as global supplies expand**

"Trucking LNG further inland would entail additional costs as well as logistical challenges: for example, a 100 megawatt (MW) baseload power plant would require, on average, around 20 daily deliveries from tanker trucks," the report explained.

Using the average price of crude oil of up to $70 per barrel, about 60 MTPA worth of small-scale LNG could be delivered at a lower cost to end-users than oil products.

## Substitution

While the substitution potential is only a fraction of oil demand in these sectors, it represents a sizeable 25 percent of the global LNG market.

Around 40 percent of the global potential lies in developing Asian markets, where gas is around 20-40 percent cheaper than heavy fuel oil and diesel for industrial consumers.

"Substitution is costlier in the Middle East, where small-scale LNG fails to compete with highly subsidised oil product prices," noted the IEA.

"Moreover, although the region has significant oil-fired electricity generation, less than a third of plants there are commercially suited to small-scale LNG (i.e. have a capacity less than 300 MW)," it added.

"Although the potential for cost-effective substitution is high, there are logistical and other hurdles to using small-scale LNG," said the report.

"Lower fuel costs and improved efficiency might be offset by the additional capital expenditure required for converting equipment, which is site- and process-specific," it noted.

Relatively high storage costs and boil-off rates are also important considerations, which makes the economics of delivering small-scale LNG-to-power plants challenging for plants running intermittently, such as being for peak-shaving purposes.

"In developing markets, affordability and logistical concerns have discouraged some potential buyers from contracting what are relatively small quantities of flexible supply that need to be delivered on short-term contracts," said the IEA.

"In addition, while a growing spot market and an expanding list of intermediaries such as trading houses can support small-scale LNG projects, contracting and financing challenges have led to projects being cancelled or delayed," it stated.

In the IEA's Stated Policies Scenario, natural gas captures almost 40 percent of the growth in industrial energy demand in emerging economies, reflecting the economic case for natural gas to satisfy incremental demand that otherwise would be met by costlier oil products, particularly in small- and medium-scale manufacturing subsectors.

"Traditional large-scale onshore regasification facilities and the build out of transmission and distribution networks underpin the majority of this growth," said the IEA.

However, the IEA is of the view that for now, the small-scale LNG market is likely to remain a niche part of global gas, with its development potential driven by smaller players serving peripheral demand in end-use markets. ■

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# For the Record

**AIR PRODUCTS**, the US LNG equipment and industrial gases company, recorded 37 percent rise in fiscal first-quarter net income and expects to spend up to $4.5 billion in 2020 on projects while also planning its largest US investment on the Gulf Coast. The company posted net income of $489 million and announced an 18-cent rise in the dividend, marking 38 consecutive years of dividend increases. Adjusted gross earnings came to $908M in the quarter, a rise of 14 percent, primarily driven by higher pricing and volumes in all three operating regions. "First-quarter sales of $2.3 billion increased 1 percent versus the prior year on 6 percent volume growth and 3 percent higher pricing, partially offset by 5 percent lower energy pass-through, 1 percent unfavorable currency and 2 percent from a contract modification to a tolling agreement in India, which impacts sales but not profits," said Air Products.

Air Products conducts its industrial gases business alongside its provision of LNG equipment products such as the main cryogenic heat exchangers for plants and its proprietary propane pre-cooled mixed refrigerant liquefaction process. Most of the worldwide LNG production comes from Air Products technology and the company provides key equipment for the natural gas liquefaction process for large export plants, small and mid-sized plants and floating LNG facilities. "I want to thank our talented Air Products team for delivering another set of strong results for the quarter," said Seifi Ghasemi, Chairman, President and Chief Executive. "Our excellent financial position allows us to invest capital strategically, and this quarter we announced our largest-ever US investment to supply Gulf Coast Ammonia in Texas," added Ghasemi. The Allentown, Pennsylvania-based company said the US investment comes from winning a long-term onsite business model supply agreement for a project with Gulf Coast Ammonia (GCA) in Texas City, Texas.

The company will build, own and operate its largest-ever steam methane reformer (SMR) to produce hydrogen which will be connected to and extend, to around 700 miles, its existing and the world's-largest hydrogen pipeline system on the Gulf Coast. It will own and operate an air separation unit (ASU) to supply nitrogen and will own and operate a steam turbine generator to supply power and other utilities to GCA's new world-scale ammonia production plant. Air Products has also signed preliminary accords to take part in industrial gases project development with the Saudi Arabian organization established in the Kingdom for the advancement of the Jubail and Yanbu economic areas. The company is additionally involved in Chinese projects such as the Lu'An gasification project. The company has three regional divisions and these were their results. Industrial Gases-Americas reported sales of $936M, a decrease of five percent, as 3 percent higher pricing and 1 percent higher volumes were more than offset by 8 percent lower energy pass-through and 1 percent unfavorable currency. Operating income was $257M, up 17 percent. Sales in the Industrial Gases-Europe-Middle East and Africa (EMEA) division came to $499M, a decrease of 5 percent. Volumes increased 6 percent and higher pricing contributed 3 percent. Operating income was $121M, an increase of 14 percent, primarily driven by higher pricing and operating margins. In the Industrial Gases-Asia division the reported sales were $693M, a rise of 11 percent. Volumes increased 9 percent, driven by new plants, base business growth and a short-term contract. Operating income was $229M, a rise of 13 percent on improved volumes and pricing. "The Air Products team remains focused on productivity, creating our own growth opportunities and delivering shareholder value," said CEO Ghasemi. "As we look ahead, we see significant opportunities to provide sustainable solutions for the world to meet its energy and productivity needs, and we are working hard to be at the heart of those opportunities," he stated.

**AUSTRALIAN** Gas Infrastructure Group (AGIG) said its final plan for Western Australia's Dampier-to-Bunbury natural gas pipeline for the 2021 to 2025 period was focused on providing excellent service and low costs. The high-pressure gas transmission pipeline stretches about 1,600 kilometres to link the gas fields of the Carnarvon Basin offshore Western Australia and the Pilbara coast and some areas of the Perth Basin, directly to customers. The AGIG plan also puts in place measures to support the DBP continuing to deliver gas to an evolving Western Australian energy market, which is a main LNG export hub, well into the future. The Plan was presented to the WA Economic Regulation Authority (ERA) and follows an extensive 18-month consultation period with customers of the pipeline.

"The pipeline is the backbone of the WA energy supply industry, linking the gas fields in the State's northwest directly to electricity generators, gas retailers, mining, and industrial customers," said AGIG. AGIG owns and operates one of Australia's largest gas infrastructure businesses with operations across every mainland state and the Northern Territory, supplying about 2 million customers. Operations include 40,000km of gas distribution and transmission pipelines, 57 petajoules of gas storage capacity, gas processing facilities and remote power generation. AGIG's Chief Executive Ben Wilson said the Plan outlines DBP activities and expenditure proposed to be undertaken from 2021 through to 2025. "Our customers told us that the cost and the reliability of our service are fundamental. AGIG's success in operating the pipeline has not required any curtailments of capacity for more than 10 years," said Wilson. "This Plan supports the continuation of this strong reliability performance in a rapidly changing energy sector," stated the CEO.

Wilson said that over the five-year period, we will deliver a standalone communications infrastructure for the northern section of the pipeline, and replace 25 control systems on compressor units and gas engines. "These initiatives will further ensure the reliability of the pipeline and confirm AGIG's ability to meet our customers' needs," he added. The regulator will now commence its review of the AGIG plan which will provide the community with further opportunity for comment. "AGIG looks forward to working with the ERA as it examines the proposals. The review is expected to be concluded by the end of the year in time for 1 January 2021," said the company. Woodside Petroleum, the LNG gas plant operator in Western Australia, has also decided to advance with a pipeline project. The Pluto-North West Shelf Interconnector will connect the Pluto LNG and the North West Shelf Karratha Gas Plant and has entered into contractual arrangements for the construction. Woodside signed an agreement with the firm DDG Operation, part of AGIG, for the construction of the pipeline. The Pluto-NWS Interconnector is a 30-inch diameter pipeline and will run for 3.2 kilometres, connecting the Pluto and NWS plants. It is part of the components of infrastructure needed to transport gas between the two and to create a wider gas hub build-out in Western Australia.

**BALTIC** Exchange freight derivatives markets for both tankers and dry cargo vessels saw increased traded volumes last year when the exchange also launched the first Forward Freight Agreement (FFA) trades in the LNG market.

Settled against the Baltic's recently launched suite of assessments for gas shipping, the first LNG swap took place in July 2019, with cleared trades following at the end of 2019 and open-interest building. The Exchange said in its annual review that freight derivatives markets for both tankers and dry cargo vessels saw increased traded volumes in 2019. In LNG, the London-based Exchange collects data from shipping brokers to provide assessment of three routes on the CME Group trading platform.

These are from Australia's Gladstone port in Queensland to Tokyo, from the US Sabine Pass LNG plant in Louisiana, owned by Cheniere Energy, to the UK. A third freight contract is from Sabine Pass to Tokyo. In the overall freight derivatives markets Tanker Forward Freight Agreement (FFA) volumes were up 38 percent in 2019 compared the previous year, reaching 473,113 lots. Dry FFA volumes hit 1,632,773 lots, up 11 percent on 2018. One lot is defined as a day's hire of a vessel or 1000 metric tonnes of ocean transportation of cargo. "It was another solid year in 2019 for the freight derivatives market," said, Baltic Exchange Chief Executive Mark Jackson. "Underpinning these volumes are both volatility in the freight markets and trust in the Baltic Exchange's settlement data," he said. "Last year both the dry bulk and tanker markets experienced big swings, with issues ranging from the Vale iron ore disaster, attacks on tanker shipping in the Middle East and IMO2020 impacting sentiment," added Jackson.

The Exchange has also just launched in February 2020 daily spot ocean freight rate indices for 40-foot containers (FEUs). The rate is now available via the Exchange and the Freightos Group, adding real-time, transparent price discovery and risk mitigation into the container freight market that powers global trade. The Freightos Baltic Index

(FBX) has been produced weekly since April 2018 by digital freight platform Freightos, based off of live pricing data from hundreds of global logistics providers. "With the robust, real-time data, as well as oversight from the Baltic Exchange, the FBX is positioned better than ever to provide a true pulse of the market in one of the world's largest and most important industries," said Freightos CEO Zvi Schreiber. "Container shipping pricing has become volatile and FBX will be the foundation of index-linking and future derivatives which allow carriers, forwarders and imports-exporters to hedge their risk, as is already customary in other industries," added Schreiber. The Exchange, which already manages a diverse range of benchmarks for the global shipping markets, is also in the process of applying for Benchmark Administrator status with the UK's Financial Conduct Authority (FCA).

**BP** of the UK and one of India's largest conglomerates, Reliance Industries, are on track for first gas from mid-2020 from projects developed to open up new Indian production when the nation is also increasing its LNG imports. The RIL-BP joint venture has committed an additional $5 billion of investments towards monetizing about 3 trillion cubic feet equivalent of natural gas, or 500 million barrels of oil equivalent, from reserves in three projects. The projects are named, R cluster, Satellite cluster and the MJ fields. "These projects will utilize the existing gas production infrastructure. Further, this infrastructure can act as a hub for development of any discovery from contiguous areas," said the BP-RIL partnership.

BP and Reliance sanctioned the projects in natural gas fields in the Krishna Godavari Dhirubhai offshore the East Coast of India. India's Krishna-Godavari Basin covers more than 19,000 square miles offshore the state of Andhra Pradesh in the Bay of Bengal. The KG-D6 block was Reliance's first offshore gas field development and its first underwater discovery. It was also India's largest deposit of natural gas when first found in 2002. "The first-gas from these fields is expected in mid-2020," they stated. "The peak production from these three fields is expected to reach 1 BCFe per day which is about 15 percent of envisaged Indian demand," they explained. The RIL-BP joint venture also confirmed that it had completed the safe cessation of production in a planned manner, from the D1 D3 field in Block KG D6, also off the East Coast.

India consumes more than 5 billion cubic feet a day of natural gas and aspires to double gas consumption after 2022. The offshore gas supplies will be in addition to LNG imports which in December 2019 surged for a ninth month in the current fiscal year as more volumes were imported at a lower cost from countries such as Qatar, the US, Australia and West African nations. LNG imports for December jumped by 22.7 percent to 2.08 million tonnes compared with the 1.70MT received in December 2018. The main operating terminals on India's West Coast are at Dahej, Hazira and Dabhol, near Mumbai. The newest terminal at Mundra is also now operational. There is also the Kochi facility in the southwest state of Kerala and one East Coast terminal at Kamarajar, 25 kilometres north of Chennai Port in Tamil Nadu. India imports about 250 cargoes a year, mainly from Qatar, the US, Russia Australia and Africa.

**BRITISH** Columbia Ferries, has awarded another newbuild contract to the Polish Remontowa Shipbuilding company in the Baltic port of Gdansk for a liquefied natural gas-powered vessel. The newbuild is scheduled to be delivered in 2022 and go into service in the Southern Gulf Islands located in the Strait of Georgia between Vancouver Island and the mainland of BC. This vessel will be identical to the three "Salish Class" ferries built by the Polish yard for BC Ferries in 2016. The 107-metre Salish Class vessel will have the capacity to carry at least 138 vehicles and up to 600 passengers and crew.

It will allow for the retirement of the "Mayne Queen", a diesel-fuelled vessel currently operating on the route.

The ship will be powered by three Wartsila engines and electrically propelled by Schottel thrusters at each

end, driven by an efficient gas-electric power plant. "Our Clean Futures Plan is our path to replace diesel fuels with cleaner energy options," said the company. "While this cannot be achieved in a single step, we are continually seeking energy sources that offer a cleaner, lower carbon-intensity option to displace non-renewable diesel," it added.

"In our move towards a sustainable future, adopting LNG is one way to reduce our impact on the environment today," stated BC Ferries.

The agreement with Remontowa is a design-build, fixed-priced contract that provides the company with substantial guarantees related to delivery dates, performance criteria, cost certainty and quality construction.

"The use of natural gas as the primary fuel that reduces GHG emissions by 15 to 25 percent, reduces sulphur oxides by over 85 per cent, reduces nitrogen oxides by over 50 percent and nearly eliminates particulate matter," said BC Ferries. The total project budget, which includes financing and project management costs, is around C$92.3 million (US$70M).

**CANADA**, through its Impact Assessment Agency of Canada (IAAC) has unveiled impact statement guidelines and a draft public participation plan for the Gazoduq pipeline project to unlock Western Canadian gas resources and supply an LNG export plant proposed for Québec. Gazoduq is planning to transport feed-gas from Western Canada and GNL Québec will export it as LNG from Saguenay, a town located about 200 miles north of Quebec City on a tributary leading to the St Lawrence River. Gazoduq itself has just submitted its Detailed Project Description to the IAAC for the proposed 780-kilometre pipeline, which will also have other customers.

This IAAC step, which is part of the planning phase of the federal regulatory process, will allow the regulator to conduct its own consultations on the administrative procedures. "It will also give the public an opportunity to learn more about the federal regulatory process," said the IAAC. The IAAC indicated it would work in collaboration with the Canada Energy Regulator (CER) throughout the integrated assessment process. Both Gazoduq and the LNG project company, GNL Québec, had previously filed preliminary documents with the former regulatory regime, the Canadian National Energy Board.

The NEB has been replaced by the new Canadian federal energy body, the IAAC, backed up by the Canada Energy Regulator. Gazoduq, as the pipeline builder , will operate the transmission line from an inter-connection with the existing mainline near Ramore, Ontario, owned by Canada's largest pipeline operator, TC Energy. Gazoduq will bring feed-gas to the liquefaction plant in the French-speaking province to what will be one of its main customers, GNL Québec. The natural gas pipeline is designed to transport around 51 million cubic metres (1.8 billion cubic feet) of natural gas per day. Gazoduq also recently completed the solicitation process for non-binding expressions of interest for transportation services on the pipeline. The company said it considered that the non-binding open season had been a success.

**CHENIERE** Energy, the largest US LNG exporter with two plants in Louisiana and Texas, said it exported its 1,000th cargo within a four-year time period after the start-up Gulf Coast production. "Reaching 1,000 cargoes of LNG faster than any producer in history is a testament to the performance of our people and the culture of our company," said Jack Fusco, Cheniere's President and Chief Executive. "Our focus on reliability and safety through the entire LNG production process enabled us to reach this milestone, while fulfilling our commitments to our foundation customers," added the CEO. "Cheniere will continue to focus on operational excellence to help meet growing demand for reliable, flexible, and cleaner sources of energy around the world," said Fusco.

Cheniere's 1,000th cargo departed on the vessel 170,000 cubic metres capacity "Hoegh Galleon" on January 26 from Cheniere's Corpus plant in Texas. "This achievement would not be possible without the dedication and diligence of Cheniere's employees, our partners and customers, and we look forward to celebrating cargo 10,000," said Fusco. The Houston, Texas-based company also celebrated the 100th cargo produced at Corpus Christi, which departed on the 160,000 cubic metres capacity carrier, "Yari LNG". Cheniere's largest plant is the Sabine Pass facility with five Trains fully operational with 22.5 million tonnes per annum of output and a sixth Train under construction. At the Corpus Christi facility, Cheniere has completed the second Train and the construction of a third Train is underway.

The US Federal Energy Regulatory

Commission also recently approved what Cheniere calls its Stage 3 project, comprising seven mid-scale liquefaction Trains adjacent to the Corpus Christi plant, each with an expected nominal production capacity of around 1.4 MTPA of LNG. The total expected nominal production capacity of the seven mid-scale Trains is around 10 MTPA. The Corpus Christi Stage 3 plant will be adjacent to the three-Train plant and together the two projects are expected will have a total nameplate production capacity of around 25 MTPA. With the 27 MTPA from the completed six Trains at Sabine Pass and the Corpus Christi Trains, Cheniere's output will rise to 52 MTPA by around 2025.

**DNV GL**, the European maritime classification society, plans to commercially launch in April 2020 a new online bunkering platform to take operators from the order process through to delivery. The DNV GL tool is called FuelBoss and offers ship owners, operators and suppliers a single common platform for nomination, scheduling, spot inquiries and business intelligence. "LNG suppliers Gasum, Cryo Shipping and Nauticor are amongst the confirmed pilot customers and have supported the development with their expertise and domain knowledge," said DNV GL. "LNG has arrived in shipping," stated the class society with offices in Oslo as well as Hamburg in Germany and other cities.

"After a long wait, the number of vessels trading will more than double in the next two years," explained DNV GL.

Analysts said that as the fleet grows from vessels that primarily work fixed routes to those in more general operation, the complexities of LNG bunkering and planning need to adapt to these changing patterns. "The idea behind FuelBoss is to accelerate the uptake of LNG in the maritime industry by providing suppliers with a highly efficient tool for managing all their customers and day to day operations, while offering ship operators a common interface for interacting with LNG suppliers ," said Trond Hodne, Senior Vice President at DNV GL Maritime. "FuelBoss will standardize and simplify daily work processes and enable the LNG fuel industry to reap the benefits of digitalization," added Hodne. "At the moment, both the interest in and the number of vessels using LNG is growing rapidly, but the bunkering picture is still fragmented. Delivery costs can be a significant part of the delivered LNG price, so optimizing the supply chain is essential," he stated.

Online and open to anyone, FuelBoss will be an integrated tool for LNG bunkering, allowing users to order bunker volumes within term contracts in a standardized format. It will also keep track of changes and monitor involved assets, communicate through an integrated messaging service and digitally fill in, sign and archive forms and documentation from the bunkering process. "The platform will facilitate spot inquiries outside term contracts and the users will also have access to a map-based overview of assets to keep track of LNG-fuelled ships and LNG bunker vessels through live and historic AIS feed," said DNV GL.

**ENI**, the Italian energy company with recent natural gas discoveries in nations such as Mozambique and Egypt, has signed an accord with the Gulf kingdom of Bahrain covering issues like LNG supply and exploration. The deal was signed between Khalifa bin Ahmed Al Khalifa, Minister for Oil for Bahrain, and Eni Chief Executive Claudio Descalzi. "The agreement will enhance collaboration in the energy sector, by facilitating the joint assessment and launch of new initiatives in areas of mutual interest, including renewable energy, LNG supply and exploration," said Eni. "In the LNG sector, the collaboration will target a more sustainable and efficient energy mix to meet Bahrain's future energy needs," it added.

Minister Al Khalifa said Bahrain was delighted to be able to share Eni's unique know-how and expertise. "This accord will allow for further discussion on collaboration between Tatweer Petroleum, the Bahrain field development company, and Eni, including the sharing of experience, expertise, and support on renewable energy, LNG supply, and exploration activities," added Al Khalifa. Eni's operations in the Middle East have

continued to grow over the last few years. Notably, Eni began operating in Bahrain in 2019, with one offshore exploration license.

The current exploration acreage in the region includes in the UAE onshore areas in Sharjah and offshore areas in Abu Dhabi and Ras Al Khaimah. In Abu Dhabi Eni also has three offshore development and production concessions and current equity production amounts to approximately 50,000 barrels per day. Bahrain has also just started commercial operations at its floating LNG import facility near Khalifa Bin Salman Port with partners including Teekay LNG, while pursuing exploration and production activities to find more gas. The LNG import facility comprises a floating storage unit (FSU) and a regasification platform. Bahrain has already taken over the charter of the FSU called "Bahrain Spirit" on a 20-year deal from shipping company Teekay, a shareholder in the project. The Bahrain LNG ownership consortium comprises four companies, owning between 30 percent and 20 percent of the shares, including the Gulf state's National Oil & Gas Authority, Teekay LNG, South Korea's Samsung C&T and the Gulf Investment Corp.

**ENI** said it signed a new long-term contract for the purchase of 1.5 million tonnes per annum of LNG from the Nigeria LNG plant at Bonny Island on the Niger Delta. The Italian agreement came after French major Total agreed a supply agreements, also for 1.5 MTPA. Eni is a growing participant in the global LNG and natural gas markets with stakes in Mozambique LNG projects and world-class natural gas finds such as the Zohr field in the Eastern Mediterranean offshore Egypt. Both Nigeria LNG accords for Eni and Total relate to production from the existing Trains 1, 2 and 3 of the NLNG facility. Nigeria LNG began in 2019 to remarket volumes from the first three Trains as initial sales contracts with buyers including Turkey's Botas and Portugal's Galp Energia expire in 2020 and 2021.

The latest deals came after Nigeria LNG took the final investment decision in December 2019 to construct the long-awaited Train 7 project and associated facilities to increase output to over 30 MTPA with a scheduled start-up in 2024. The brownfield development will raise the annual production capacity at Bonny Island from the current nameplate capacity of 22.5 MTPA. The expansion project will enable the production of an additional 7.6 MTPA of LNG, of which 4.2 MTPA will come from one new liquefaction Train (Train 7), and with another 3.4 MTPA coming from the debottlenecking of existing Trains. NLNG is a world-class six-Train plant in operation since 1999 and in 20 years has delivered over 4,700 LNG cargoes. Eni is a founding partner of NLNG and holds a 10.4 percent shareholding. The other main shareholders in the existing six Trains are Total, Royal Dutch Shell as well as Nigeria National Petroleum Corp. (NNPC), which owns 49 percent of the venture.

**EXMAR**, the Belgian shipping company with more than 40 vessels in its fleet now mostly focused mainly on the liquefied petroleum gas business, said the its "Tango FLNG" vessel chartered to Argentina exported its third cargo as the company's finances also improved. Exmar gave an FLNG and financial update as it said that China Export Credit Insurance Corp. had approved the release of around $40 million from the debt service reserve account under the "Tango FLNG" loan facility. The vessel, chartered by Argentine energy company YPF, formally started its operations in June 2019 and the 10-year charter term began on 14 September. In the meantime the "Tango FLNG" exported its third cargo.

The "Tango FLNG" production barge is deployed at the port of Bahia Blanca to produce around 500,000 tonnes per annum of LNG for domestic sale or export.

The company continues to manage 10 LNG floating storage and regasification units FSRUs, though is not directly involved in regasification projects with former partner Excelerate Energy of the US. Exmar added that had two Very Large Gas Carriers under construction at the Jiangnan shipyard, near Shanghai, in China, were due for delivery in the course of 2021. "The two vessels will each enter a five year time-charter to Equinor (of Norway) upon delivery from the shipyard," said Exmar. Exmar explained

that it had obtained funds under a pre-delivery financing of $20M with Maritime Asset Partners, which partially covers the instalments during the construction of these two vessels. “With the structural developments and extension of the bridge loans, Exmar is in a stable cash position to cover its current liabilities and address its future cash requirements,” stated the Antwerp-based company.

Exmar has also made executive changes in January 2020 as it tries to improve finances after several setbacks to meet the challenges of the year ahead. It named Francis Mottrie in the new position of Deputy Chief Executive. He will take up responsibility for the internal management. Mottrie was CEO of Bexco, producer of synthetic ropes for various industrial applications and a subsidiary of the Exmar Group. Prior to that, he spent over 20 years in the maritime industry with companies such as Safmarine and later AP Moller Maersk in various leadership roles. “We are convinced that with Francis Mottrie we have the right person to further develop the company and capitalize on its strong market position,”, said Exmar CEO Nicolas Saverys. Exmar said it now had a new simplified executive responsibilities comprising Exmar Shipping led by Jens Ismar, Exmar Infrastructure (with LNG infrastructure and Offshore) headed by Jonathan Raes Exmar and Shipmanagement under Joris Daman. The newly composed Exmar Executive Committee will be represented by: Nicolas Saverys (Group CEO); Francis Mottrie (Deputy CEO); Patrick De Brabandere (CFO); Jens Ismar (Executive Director Shipping); and Jonathan Raes (Executive Director Infrastructure).

**FEDERAL** Energy Regulatory Commission Chairman Neil Chatterjee said the Office of General Counsel would reorganize to more expeditiously process requests for rehearing of Natural Gas Act (NGA) orders filed by affected landowners. The announcement covering Section 7 certificate orders in the NGA builds on Chatterjee’s September 2019 pledge to refine the FERC process to prioritize rehearing requests involving landowner issues, with a target of issuing rehearing orders within 30 days and reducing the use of tolling orders.

At that time, Chatterjee designated attorneys in the rehearings group of the Solicitor’s Office to focus on rehearing requests involving landowner issues. “Our objective is to reinforce the Commission’s commitment to ensure landowners are afforded a judicially appealable rehearing order as quickly as possible,” said Chatterjee. “I am confident that this action will help substantially reduce the amount of time we take to issue rehearing orders in these critical cases,” stated the FERC Chairman. The measure will improve landowner rights in large-scale pipeline projects, though also in the LNG feed-gas pipeline permit area where the infrastructure is less than 100 miles in length. LNG export projects, particularly in the second wave of ventures being development along the Gulf Coast of Texas and Louisiana, have many affiliate pipelines and sometimes more than one. Under the plan, Chatterjee has directed the creation of a new Rehearings section within OGC, akin to the six existing sections in that office: Energy Markets 1 and 2, Energy Projects, General and Administrative Law, the Solicitor’s Office and the Dispute Resolution Service. The FERC said the Rehearings section will have two separate groups, a Landowner Rehearings group and a General Rehearings group.

The Landowner Rehearings group will give first priority to landowner rehearing requests, and would work on other rehearing items only when time permits.

This allocation of resources, Chatterjee

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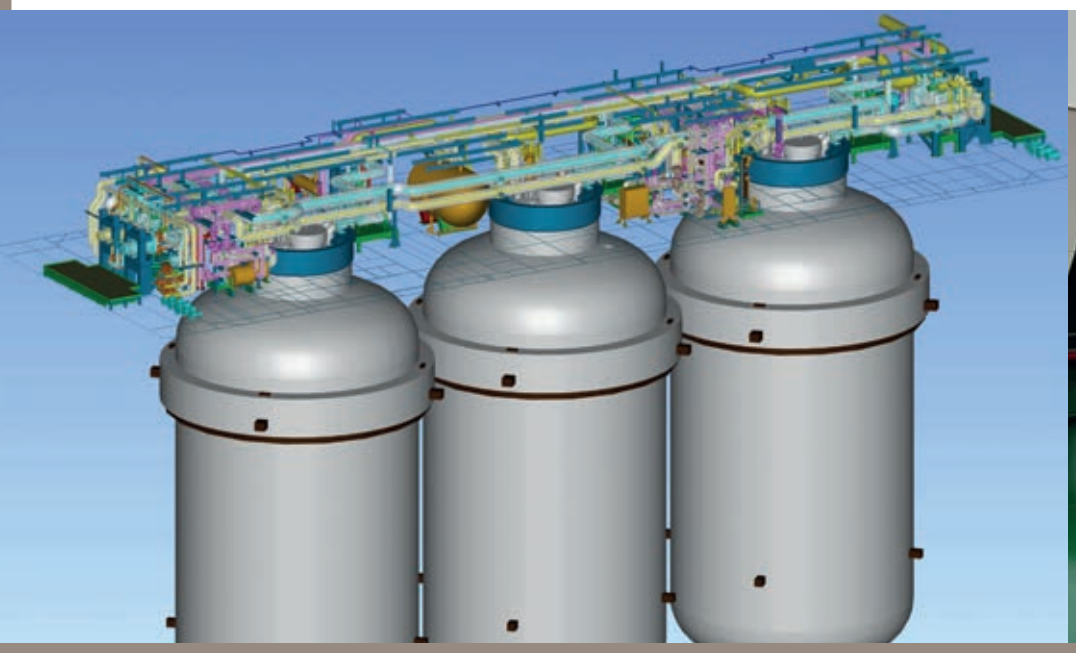

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said, would allow for more timely action on expected landowner requests for rehearing. "We are hopeful that these actions will help alleviate the very real landowner concerns about timing and fairness in infrastructure cases implicating landowner rights," Chatterjee said. "I remain committed to doing all we can to improve our FERC processes on this front," he added.

**GASUM** of Finland, the Nordic LNG supplier, has carried out its 200 ship-to-ship bunkering operation as maritime use of the fuel gathers pace in northwest Europe. The refueling was carried out by the 5,800 cubic metres of capacity bunkering vessel "Coralius", a supplier of LNG fuel in the North Sea and the Skagerrak areas since 2017. Gasum said the receiving vessel was the Fjord Line's LNG-powered ferry "Stavangerfjord" as the ship underwent scheduled maintenance at the Fayard shipyard in Odense in Denmark. "We normally supply LNG to 'Stavangerfjord' by a loading arm on a regular basis directly from our LNG plant in Risavika (Norway)," said Gunnar Helmen, Sales Manager at Gasum. "It's great to get this opportunity to supply the cruise ferry with LNG in dock in Denmark. Having been fueled with fresh LNG, 'Stavangerfjord' will return to her regular Stavanger-Bergen-Hirtshals route," added Helmen.

The "Stavangerfjord' and her sister ship "Bergensfjord" are the first and largest cruise ferries in the world that are fueled fully on LNG and both started operating in 2013. "We're very happy with the longstanding relationship with Gasum and the support we've received over the years," said Richard Ternblom, Chief Executive of Fjord Line. "We're pioneers in LNG-fueled cruise ferries on this scale and, as such, not everything works according to plan in the early start-up years. In this context, a professional partner like Gasum makes this transition to a greener maritime world simpler and safer," added Ternblom. Gasum also supplied its first cruise liner with LNG in November 2019 at the Finnish Meyer Turku shipyard in the port of Turku.

Fully owned by the state of Finland, Gasum has LNG import assets in Finland and Sweden and LNG liquefaction as well as marine bunkering services through its former Skangas business, now integrated and operating under the Gasum banner. The company's strategy includes an expansion to provide 50 LNG fuel stations by the early 2020s for Nordic transportation companies in Finland, Sweden and Norway. Gasum is the largest LNG infrastructure owner in the Nordic countries as well as leader in promoting LNG as a fuel for the maritime sector and for vehicles and industry. It has its liquefaction plant in Risavika in addition to owning and operating regasification and import terminals in Ora in Norway, Lysekil in Sweden and Pori in Finland. Gasum is also a shareholder in Finland's second LNG import terminal in Tornio.

**GAZODUQ** Inc., the Québec natural gas developer of a pipeline from the province of Ontario to the GNL Québec liquefaction and export plant, has taken another step in the regulatory permit process to unlock Western Canadian gas resources. Gazoduq proposes to transport feed-gas from Western Canada and GNL Québec will export it as LNG from Saguenay, a town located about 200 miles north of Quebec City on a tributary leading to the St Lawrence River. The company has just submitted its Detailed Project Description to the Impact Assessment Agency of Canada (IAAC) for proposed 780-kilometre pipeline, which will also have other customers. "This is another important step in the impact assessment process before the IAAC," said Gazoduq.

The filing to the IAAC contains detailed presentation of the project components, which will be subjected to an impact statement and then jointly assessed by the IAAC and the Canada Energy Regulator (CER). It also includes a description of Gazoduq's information and consultation efforts carried out to date with Indigenous groups and local communities. Gazoduq additionally answers questions provided by the IAAC following its period of engagement and consultation with the public regarding the initial project description. "The company is also continuing its consultative activities through regional round tables, and through meetings with private land owners and with stakeholders in civil safety and emergency management," said Gazoduq.

Both Gazoduq and GNL Québec had previously filed preliminary documents with the former regulatory regime, the Canadian National Energy Board. The NEB has been replaced by the new Canadian federal energy body, the IAAC, backed up by the Canada Energy Regulator. Gazoduq is the pipeline builder and will operate the transmission line from an inter-connection with the existing mainline near Ramore, Ontario, owned by Canada's largest pipeline operator, TC Energy. Gazoduq will bring feed-gas to the liquefaction plant in the French-speaking province to what will be one of its main customers, GNL Québec. The natural gas pipeline is designed to transport around 51 million cubic metres (1.8 billion cubic feet) of natural gas per day. Gazoduq also recently completed the solicitation process for non-binding expressions of interest for transportation services on the pipeline. The company said it considered that the non-binding open season had been a success.

**GAZPROM**, the Russian pipeline giant and owner of the Sakhalin LNG export plant in the Far East, has sent a delegation to meet leaders in Bangladesh to discuss energy cooperation in exploration and production and LNG. The Gazprom group was led by Vitaly Markelov, Deputy Chairman of Gazprom board. Markelov and Syed Ashfaquzzaman, a board member of the Bangladesh state-backed energy company PetroBangla, signed a five-year accord for strategic cooperation. Gazprom added that Markelov also held a working meeting with Sheikh Hasina, the Prime Minister of Bangladesh. Bangladesh currently has two LNG import facilities, both floating storage and regasification units.

The first FSRU can handle around 3.75 million tonnes per annum of LNG and was commissioned at Moheshkhali Island in August 2018 as the first Bangladesh import facility. The Asian nation then inaugurated its second FSRU in May 2019 called "Summit LNG" and deployment offshore the port of Cox's Bazar. The FSRU is part of a project involving Singapore-based Summit Power International and Excelerate Energy of the US, owner and operator of the FSRU. Gazprom and PetroBangla have previously signed contracts to build exploratory and development wells at a number of gas fields in Bangladesh, including on the construction of two prospecting and exploration wells on Bhola Island in the south of Bangladesh.

**GRTGAZ**, the French natural gas network operator and owner of LNG import terminals, said there had been a "massive" return of the fuel to Europe and France in the past year as it revealed plans to move LNG by rail to increase availability in Eastern France. The company said in its annual review that French LNG import terminals in the north, the west and the south of France had their largest number of shipments in 10 years. Qatar also kept its lead as Western Europe's main LNG supplier, though Russia was quickly closing the gap. GRTgaz also noted that for the first full year of operations of the French single trading zone, Trading Region France, the average wholesale price of gas on the market dropped sharply by almost €10 per megawatt hour. It stated that in 2019, the average price per MWh of gas was €13.6 per MWh compared with €23.2 per MWh in 2018.

Three of France's LNG terminals, Fos Tonkin, Fos Cavaou and Montoir-de-Bretagne, are operated by Elengy within the Engie Group and as subsidiaries of GRTgaz. The TRF gas market was created jointly by the north and south network operators, GRTgaz and Teréga. It has a single exchange point for gas known as the PEG and which was previously divided into the PEG North and the PEG South. GRTgaz said the proportion of LNG shipped to Western Europe in 2019 comprised 21 percent of cargoes from Qatar, 20 percent from Russia, 15 percent from the USA, 15 percent from Nigeria, 11 percent from Algeria, 8 percent from Trinidad, 4 percent from Norway, 2 percent from Peru and 4 percent from other nations. The company said its Fos LNG hub for tanker truck loading at the Fos Cavaou terminal near Marseilles was handling up to 11,000 slots per annum.

GRTgaz said that its subsidiary, Elengy, was studying plans for the installation of LNG storage in Alsace in eastern France, served by train deliveries. "Up to 85,000 tonnes of LNG per year would help meet the retail LNG needs of central-western Europe for road, river and industrial transport," said report. "France recorded an 87 percent increase in LNG inflows to 219 terawatt hours TWh, the highest level of imports in the past 10 years," said the company. "As a result, 2019 is a record year for gas transits to adjacent countries with 115 TWh exported (compared to 67 TWh in 2018) and a 75 percent increase in outflows to Spain and Switzerland compared with 2018," said GRTgaz. "This unprecedented configuration of flows has favoured the diversification of gas sources in Western Europe and the competitiveness of the price of gas on the wholesale market in France, which now benefits all customers, in both the North and the South," it added.

**GTT**, or Gaztransport and Technigaz, the French technology firm for designs of systems for the maritime transportation and storage of liquefied natural gas, has been chosen by Marseille-based shipping group CMA CGM to provide services for its LNG-powered container ships. GTT said it would provide assistance for the commissioning, operation and maintenance of CMA CGM's future 23,000 TFE (twenty-foot equivalent) LNG-powered container ships equipped with GTT membrane containment technologies. Paris-based GTT noted that with 18,600 cubic metres capacity LNG tanks, these ships will be the largest container ships in the world to use LNG as fuel. Bunkering vessels owned by French energy major Total and Mitsui Osk Lines of Japan will supply 300,000 tonnes per annum of LNG fuel to CMA CGM and its nine ultra-large newbuild containerships set to operate on the Europe-Asia trade route. The GTT service package includes the training of crews of the CMA CGM fleet through the provision of the G-Sim training simulator, specially adapted to replicate the LNG operations of CMA CGM vessels.

"GTT will also provide on board technical assistance during the commissioning of LNG tanks and during the first bunkering operations," explained the tanks designer. It explained that, if necessary, CMA CGM may use a GTT service called "Hears" to obtain 24/7 technical assistance. "Thanks to the data continuously collected on board, the GTT teams will be able to assist and advise CMA CGM teams as closely as possible," said GTT. "In addition, the analysis tools integrated in the connected version will allow a follow-up over time of the tanks and their insulation spaces," it added. The company said its GTT services portfolio facilitates a smooth entry into the world of LNG for ship-owners.

"We are constantly expanding our range of services to meet the new expectations of ship-owners and are therefore very pleased to be able to support CMA CGM in the commissioning, operation and maintenance of its LNG-powered vessels," said Philippe Berterottière, Chairman and Chief Executive of GTT. CMA CGM is one of the world's largest container vessel operators with over 500 ships. The first of the ultra-large LNG-power containerships took to the water at the Shanghai Jiangnan-Changxing Shipyard in October 2019 at an event attended by Rodolphe Saadé, Chairman and CEO of CMA CGM. The first of the nine newbuilds was named "CMA CGM Jacques Saade" after the shipping line's Beirut-born founder who died in June 2018.

**INDIAN** liquefied natural gas imports surged for a ninth month in the current fiscal year as more volumes were imported at a lower cost from countries such as Qatar, the US, Australia and West African nations. LNG imports for December jumped by 22.7 percent to 2.08 million tonnes (2.82 billion cubic metres) compared with the 1.70MT received in December 2018. Shipments received in the previous month of November had surge by 19 percent to 1.95MT compared with 1.64MT in the same month the previous year. Deliveries for the first nine months of the fiscal year came to 24.71 Bcm (18.29MT) versus 16.34MT (22.08 Bcm) an increase of 12.0 percent compared with the same period in the previous fiscal year, according to the Indian Ministry of Petroleum and Natural Gas. The main operating terminals on India's West Coast are at Dahej, Hazira and Dabhol, near Mumbai. The newest terminal at Mundra is also now operational.

There is also the Kochi facility in the southwest state of Kerala and one East Coast terminal at Kamarajar, 25 kilometres north of Chennai Port in Tamil Nadu. India imports about 250 cargoes a year, mainly from Qatar, the US, Russia Australia and Africa. The Ministry figures also showed that December LNG imports cost India around $800M during the month, less than the $900M spent in December 2018. The cost of the fuel from April to December 2019 was about $7.1Bln versus $8.0 Bln in the year-ago period. The final monthly total of cargoes received at Indian regasification facilities was around 30 shipments. Indian domestic production of natural gas for the month of December was 2.64 Bcm compared with 2.86 Bcm in December 2018, down 7.9 percent. Output for the nine months to the end of December 2019 came to 23.85 Bcm versus 24.65Bcm in the previous fiscal year, a fall of 3.2 percent.

Energy consultants Wood Mackenzie noted in their last Indian gas report that output was expected to grow in 2020 after upstream sector disappointed during 2019. "It was a disappointing year in 2019 as oil and gas production declined. Major reforms were introduced for licensing, but these failed to translate into successful bid rounds," said the Wood Mackenzie report. "Gas production is set to rise by 9 percent, underpinned by deepwater projects operated by Reliance (KG-D6) and ONGC (KG-DW-98/2). Both projects are on track for a 2020 start-up, although we expect only one well to be onstream in ONGC's field," it added. The report stated that LNG demand growth would depend on the pace of the city-gas and regasification infrastructure build-out. "In 2020, additional regas capacity is vital for India to fully benefit from the low spot LNG prices," said Wood Mackenzie. "The commissioning of two new terminals, Mundra and Jaigarh, slipped into 2020. The other main addition to capacity will be the expansion of Dahej by 2.5 MTPA, which should be completed during 2020," added the report. The Mundra facility, co-owned by Gujarat State Petroleum Corp. and the Adani Group, was mechanically completed about a year ago. The terminal at Mundra Port is north of Mumbai and is designed with two storage tanks and capacity of 5 MTPA.

**JAPAN** Oil, Gas and Metals National Corp. (Jogmec), a state agency, is having its financing and aid rules changed so that companies from Japan can invest in more LNG import terminals in southeast Asia and in trans-shipment stations for Russian volumes. Japan currently supports companies involved in LNG projects through investment and loan guarantees via the government Jogmec. However, Jogmec is limited to helping to finance upstream operations, such as natural gas exploration and production. New legislation is being introduced in Tokyo to allow Jogmec to support investment in projects further downstream, such as LNG terminals in other countries so that they can import the fuel. Transporting the fuel over long distance efficiently also requires LNG to be reloaded at trans-shipment facilities, the development of which will also be aided under the plan.

Global LNG demand is projected to double by 2040, according to the International Energy Agency. Japan is currently the biggest importer with 77.32 million tonnes of LNG received in 2019, 6.7 percent down on the 82.85MT purchased in 2018. The second-largest importer is China with 61MT received in 2019. The easing of Jogmec's aid for the construction of LNG terminals is expected to help Japan expand its LNG trading activities with more low-priced shipments from the US export expansion pointed at Asia. Jogmec is likely to get involved with plans by Novatek, operator of the Yamal LNG plant and lead developer of the Arctic II LNG project, and Japanese shipping company Mitsui OSK Lines to cooperate on the construction of LNG trans-shipment stations on the Kamchatka Peninsula in the Russian Far East and near the Barents Sea port of Murmansk.

The proposed trans-shipment projects will secure additional LNG cargoes for Asia via the Northern Sea Route from the Yamal facility and the Arctic project planned for the Gydan Peninsula. The construction of the Kamchatka and Murmansk trans-shipment complexes will help to optimize logistics and maximize the efficiency of LNG deliveries from Yamal and Gydan to growing LNG markets in North Asia and southeast Asia. Jogmec is already an investor with trading house Mitsui & Co. in the Arctic LNG II venture, which is regarded as upstream production and therefore qualifies for investment.

**KBR**, the US engineering and LNG contractor, was awarded a major project management consultancy services contract for the Ghasha portfolio of gas projects by Abu Dhabi National Oil Company in the United Arab Emirates, the oldest LNG producer in the Middle East. The Ghasha mega-project for sour gas is located on the north-west shore of Abu Dhabi and Adnoc is developing the project, estimated to have a daily production capacity of around 1 billion cubic feet of gas. The Ghasha production has the potential to meet about 20 percent of the UAE's gas demand by around the second half of the decade. In addition, more than 120,000 barrels per day of oil and high-value condensates are expected to be produced when the project is on stream. The Ghasha concession has a validity of 40 years and comprises three gas and condensate fields: Hail, Ghasha and Dalma.

Under the terms of the KBR contract, the Houston-based company will act as the main PMC contractor responsible for managing the successful engineering, procurement and construction (EPC) contractors for packages A & B of the Dalma Gas Development Project, Packages 1-5 of the Hail & Ghasha Development Project, the Hail & Ghasha Islands Project as well as the Deep Gas Project. "This work is expected to be performed over four years with an optional extension for two more years," said KBR, whose other main contract in the Arab Gulf region is at Oman LNG. The UAE region also holds the oil, gas and condensate fields Nasr, Sarb and

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Mubarraz. Adnoc has a 60 percent stake in the concession. The second-largest shareholder is Italian energy company Eni with 25 percent. "We deeply appreciate the tremendous amount of trust that Adnoc has placed in KBR to project-manage such a significant share of this strategic concession program," said Stuart Bradie, KBR President and Chief Executive. "This award highlights Adnoc's confidence in KBR's reputation as the industry leader in the provision of value-added PMC services for similar mega gas-field development projects," added Bradie. "We look forward to continuing our long-term relationship with Adnoc and to demonstrating once again our world-class ability to manage large-scale, complex projects such as this on time, within budget, but most of all with a strict safety culture," stated Bradie. "We are confident that the Ghasha concession project will significantly boost in-country Value. As always, KBR remains fully committed to act as one of Adnoc's strategic partners to achieve the targeted objectives," he said.

Adnoc's growth strategy focuses on unlocking and extracting maximum value from the available gas reserves in Abu Dhabi. It also aims to achieve gas self-sufficiency and transform the nation into a net exporter of gas. Adnoc proposes to create an ultra-sour gas hub in the region with the addition of Ghasha concession fields to the existing Shah Arab reservoir. The UAE is the oldest LNG producer in the Middle East from its Das Island plant offshore Abu Dhabi consisting of three Trains with capacity of around 5.5 million tonnes of LNG per annum. Adnoc recently confirmed new discoveries of gas in place totaling 15 trillion cubic feet and intends to continue LNG production for 40 more years and to increase its discovered resources.

**MCDERMOTT** International, the US energy and LNG engineering company, was awarded a large contract by Anglo-Australian commodities and energy firm BHP for subsea work on the Ruby Project, offshore the LNG producing nation Trinidad and Tobago. McDermott, which is currently undergoing a corporate overhaul under Chapter 11 bankruptcy protection, will provide subsea umbilicals, risers and flowlines (SURF), transportation and installation, as well as the pre-commissioning of one jacket and topsides for the Ruby venture. The Ruby Field is in the Block 3 (a) development area of Trinidad, about 28 miles (45 kilometres) off the northeast coast. The field has estimated recoverable resources of 13.2 million barrels of oil and 274 billion cubic feet of natural gas.

First production is expected within a year and peak output is expected to be about 16,000 barrels of oil per day and around 80 million standard cubic feet per day of natural gas. "We are pleased to support BHP in this new contract that continues to build on our successful track record in Trinidad ,"said Mark Coscio, Senior Vice President, North, Central and South America. "The combination of heavy lift and pipelay capabilities of McDermott's Derrick Lay Vessel (DLV) 2000 are best suited for this project as it can efficiently transport and install both the flowlines and platform," added Coscio. McDermott successfully executed a similar installation scope for the BP Trinidad & Tobago (BPTT) Angelin project last year. It also was awarded a contract in January of 2019 by BPTT for the engineering, procurement and construction of the Cassia Compression Platform, located 35 miles off the coast of Trinidad. BHP, as the operator, holds a 68.46 percent interest and Heritage Petroleum and the National Gas Company of Trinidad and Tobago (NGC) hold 20.13 percent and 11.41 percent respectively.

Engineering and project management of the project will be performed in Houston with engineering support from McDermott's Mexico City office. McDermott's DLV 2000 is scheduled to transport and install the flowlines and platform. The project will begin immediately with completion expected in August 2020. Despite its corporate troubles, McDermott is involved in some of the world's leading LNG construction projects, including several on the US Gulf Coast and the North Field Expansion in Qatar. Currently McDermott is working with other firms on both the Cameron LNG project at Hackberry in Louisiana and the Freeport export facility at Quintana Island in Texas. McDermott has additionally been engaged as a contractor on the Golden Pass LNG export project for Qatar Petroleum and ExxonMobil venture in Texas. The Houston-based company has suffered financial problems since it completed the $6 billion deal in 2018 to buy LNG rival engineering, procurement and construction company Chicago Bridge & Iron (CB&I).

**NATURGY** Energy Group, the Spanish utility and importer of US and Russian LNG, posted an annual net profit of after the previous year's losses amid continuing challenges in its businesses in Europe and South America. The company said ordinary net income in 2019 came to 1.40 billion euros ($1.61Bln) compared with losses the previous year of 2.82billion euros. Its annual net sales amounted to 23.03 billion euros, which was 5.4 percent below the 2018 level, mainly as a result of lower energy prices and volumes sold in the liberalized businesses that have not been offset by growth in the infrastructure businesses. During last year, Naturgy's corporate overhaul included the disposal of the gas distribution and supply business in Italy, the sale of the gas distribution business in Colombia and offloading of a minority stake in the gas distribution business in Spain.

The company said its gross earnings from LNG dropped by 30.6 percent to 344 million euros from 496M euros in the previous year. Naturgy is one of the companies that have signed 20-year agreements for US cargoes from Cheniere Energy's Sabine Pass and Corpus Christi plants and is also a main contract holder for cargoes from the Yamal LNG plant in Arctic Russia operated by natural gas company Novatek. The US and Russian volumes were booked under Naturgy's previous name, Gas Natural Fenosa. The Spanish company's diverse LNG supply portfolio also includes shipments from nations such as Algeria, Qatar, Nigeria and Norway. The company additionally owns a small fleet of LNG carriers.

"Ordinary Ebitda declined 2.3 percent during the period, despite a strong performance in gas, power and service sales as well as International power generation which could not compensate for the weak performance in International LNG and Europe power generation as a result of lower sales and margins during the period," said Naturgy. The company added that there was still an amount of stability in its LNG business thanks to contract management and supply benefits from lower procurement costs for Algerian and Norwegian cargoes. Natural gas sales declined by 9.4 percent during the year, mainly as a result of lower sales in the Spanish industrial and residential segments, down 14.5 percent and 10.2 percent respectively, as a result of increased competition and milder weather. This was partially offset by higher sales to combined-cycle, gas-fired power stations, up 20.7 percent. Naturgy had earlier in October 2019 announced an acquisition with state-run Algerian company Sonatrach of the stake in Medgaz natural gas pipeline from Algeria to Europe held by United Arab Emirates energy company Mubadala, through Cepsa. "This transaction allows Naturgy to increase its stake in Medgaz from its current 14.95 percent to a 49.0 percent, becoming a strategic stake," said the earnings report.

**ORIGIN** Energy, the Australian utility and upstream supplier for the Australia-Pacific LNG export plant in Queensland, whose other shareholders are ConocoPhillips and Chinese major Sinopec, said the plant logged record production. APLNG shipped 35 cargoes in the three months to the end of December compared with 31 shipments in the previous three months. The plant's average realised price declined by 11.4 percent year-on-year to US$9.38 per million British thermal units compared with US$10.59 per MMBtu in the same three months of 2018, while spot prices dropped by more than 50 percent because of high available global volumes. Origin's statement came in its report covering two divisions, Integrated Gas for LNG and domestic supplies and the Energy Markets unit containing its electricity and utility business.

The plant on Curtis Island in Queensland produces almost 9 million tonnes per annum from two Trains and 7.6 MTPA is contracted to Sinopec, whose formal name is China Petroleum & Chemical Corp. "Production by Australia Pacific LNG, rising 2 per cent from the September quarter, benefited from a ramp-up of the Eurombah Reedy Creek InterConnect pipeline, less maintenance and improved non-operated production performance," said Origin. The Sydney-based company said that its share of revenue rose 4 percent on the previous quarter to A$717 million (US$482M), though was down on the year-ago quarter when it was A$741M. APLNG also delivered net cash distributions of A$520M (US$349M) in the first half of Origin's fiscal year. Sinopec holds a 25 percent stake in APLNG while Origin and ConocoPhillips each hold 37.5 percent of the shares. The Sydney-based utility said electricity and gas sales declined quarter on quarter, mainly due to seasonality.

Origin also noted that its Mortlake Power Station in the southern state of Victoria returned to service in late December 2019. "Australia Pacific LNG has again delivered a strong performance with record production and 35 cargoes loaded and shipped for the quarter, while continuing to be a major supplier into the domestic market," said Origin Chief Executive Frank Calabria. "As expected,

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our electricity and gas volumes were down for the period, though our existing EBITDA guidance for the full year is unchanged," added the CEO. "Importantly, our generation team successfully returned a Mortlake unit to service ahead of the summer peak demand period, following an electrical fault in July," explained Calabria. "Despite the challenges posed by bushfires in recent weeks, our power stations are operating well and supplying the market as needed, and we continue to support our customers that have been impacted," stated the CEO.

**PAPUA** New Guinea's LNG export plant has achieved record production as talks continued on the expansion project to reach an "equitable" solution for both the government and the energy companies. The two existing LNG Trains at the plant northwest of Port Moresby have a nominal capacity of 6.9 million tonnes per annum and shareholder Oil Search said in its fourth-quarter report that PNG LNG achieved record gross production of 8.5MT from two Trains, 2 percent higher than the previous record reached in 2017. "This was despite volumes being impacted by scheduled plant maintenance in the second quarter of 2019 and a short curtailment of production in the third quarter, while repairs were made to the Kumul Marine Terminal offshore liquids loading facility," said Oil Search.

Oil Search, the Australian-listed company whose headquarters are in PNG, noted that the Papua LNG expansion project has seen legislative changes passed while the second required accord, the P'nyang Gas Agreement, is the subject of continuing discussions. "Ten legislative changes required for the Papua LNG Project Gas Agreement were passed during the quarter, while detailed discussions took place between the PRL 3 (P'nyang) Joint Venture and the PNG Government on terms for the P'nyang field development," explained Oil Search. "Agreement on these terms was not reached by the end of 2019, which was the targeted timeframe. However, negotiations recommenced in early January and are ongoing, with all parties working to reach an equitable outcome," the company added.

Three other Trains are planned in the expansion and the five Trains when operational would have an actual capacity of nearly 20 MTPA. The P'nyang field licence, controlled by PNG LNG plant operator ExxonMobil, also includes Australian-listed Santos as well as Oil Search. The Papua Gas Agreement is with holders of the Elk-Antelope gas field licence, led by Total and also including shareholders in the P'nyang field lease, ExxonMobil and Oil Search. Elk-Antelope onshore gas fields are covered by petroleum retention licence PRL15 and by the Papua Gas Agreement and the P'nyang onshore gas fields are in the PRL3 licence area of PNG. All the companies have said finalization of the P'nyang Gas Agreement and the passing of associated legislative changes are pre-requisites for launching the front-end engineering and design phase of the proposed three-Train LNG development.

## Diary of events

**March 2020**
**6th International LNG Congress**
2 - 3 March 2020
Tangla Hotel Brussels.
Avenue Emmanuel Mounier 5,
Woluwé St Lambert, Brussels 1200
Belgium
https://lngcongress.com

**Australasian Oil & Gas Exhibition & Conference**
11-13 March 2020
Perth Convention & Exhibition Centre
21 Mounts Bay Road, Perth, WA, 6000,
Australia

**April 2020**
**CWC Japan LNG & Gas Summit**
23-24 April 2020
Tokyo Marriott Hotel,
4-7-36 Kitashinagawa, Shinagawa City,
Tokyo, 140-0001 Japan

**PTTEP** of Thailand, the oil and gas producer and LNG stakeholder, said it was aiming to maximize the value of existing projects and was proceeding with the development of the Mozambican Area 1 project with its partners and the Algeria Hassi Bir Rekaizto venture to contribute to long-term growth. The Bangkok-based company reported 2019 net profit of $1.56 billion, an increase of 40 percent from 2018, as sales volumes improved from projects such as the additional stakes purchased in the Bongkot field in the Gulf of Thailand. PTTEP, whose official name is Exploration and Production Public Company Limited (PTTEP), forecasts an increase in sales volume of 11 percent in 2020 as it continued its efforts to secure Thailand's energy security.

Phongsthorn Thavisin, President and Chief Executive, said that the total revenues in 2019 jumped by 17 percent to $6.41Bln (equivalent to 198.82Bln Thai Baht), increasing from $5.45Bln (176.68Bln Baht) in 2018. The results were helped by the acquisitions of assets from US company Murphy Oil in Malaysia. "Consequently, the average sales volume last year reached 350,651 barrels of oil equivalent per day (boed) or a 15 percent increase from 305,522 boed in 2018," said the CEO. In the LNG sector, PTTEP has an 8.5 percent stake in the Area 1 licence of the Rovuma Basin offshore Mozambique.

Part of the overall stake, about 26 percent, was transferred to French major Total from Anadarko Petroleum of the US as a side-deal to the Occidental Petroleum takeover of Anadarko. PTTEP's Malaysian acquisition from Murphy of the US includes a large stake in the Rotan natural gas discovery offshore Malaysia, which is subject to a floating LNG joint venture. PTTEP's deal with Murphy comprised five Malaysian oil and gas projects located in shallow and deep water off Sarawak and Sabah. Phongsthorn also said that the "expand" strategy which includes both domestic and international acquisitions and winning bids, drove the average sales volume to reach a record high of 350,651 boed. "In addition to higher petroleum sales volume, we have also increased petroleum reserves as targeted," said Phongsthorn. "We are capable of adding more reserves in the future if our exploration projects are proved successful," he added. "This is not only building growth for PTTEP but also elevating the country's energy security in the long term," stated the CEO.

**QATARGAS** has supplied a liquefied natural gas commissioning cargo for India's newest receiving terminal at Mundra in the northwest of Gujarat state.

The shipment was delivered by the Q-Flex carrier "Murwab", with 216,000 cubic metres capacity, after being loaded in Ras Laffan in Qatar on January 17.

The Mundra facility is co-owned by Gujarat State Petroleum Corp. and the Adani Group. The terminal has been operationally ready since late in 2018 while commissioning has been delayed because of onshore pipeline requirements and the final agreement and completion of commercial operation document.

The Mundra Port terminal is north of Mumbai and is designed with two storage tanks and capacity of 5 million tonnes per annum, while being able to accommodate the largest carriers. Indian Oil Corp. completed India's only East Coast terminal at Kamarajar Port early in 2019 and Qatargas also supplied the commissioning shipment in February 2019 for that facility. India's four other operating import terminals are at Hazira, Dahej and Dabhol near Mumbai and at Kochi in the southwest state of Kerala. The East Coast terminal at Kamarajar, formerly one of India's main coal ports and previously called Ennore, can handle around 5 MTPA for Indian Oil, a state-backed refiner and fuel distribution company that is also a shareholder in Petronet LNG.

The Kamarajar terminal is located 25 kilometres north of Chennai in the state of Tamil Nadu. The monthly total of cargoes recently received at Indian terminals averaged about 30 shipments and will increase as more terminals are completed, especially on the East Coast. Qatargas has established a strong partnership with India since July 1999 when it started supplying LNG to Petronet. "Since then it has delivered more than 2,000 cargoes under its various long-term sales and purchase agreements as well as supplying significant volumes into the short term and spot markets," said Qatargas.India is a key market for Qatargas given its geographical proximity and growth potential.

**TELLURIAN** Inc., the developer of the Driftwood LNG plant in Louisiana, said that Cheniere Energy, the largest US exporter, had permanently dismissed all claims against Tellurian Chairman Charif Souki, the former Cheniere Chief Executive, and Tellurian Vice Chairman Martin Houston. The claims against the Tellurian executives had initially been heard at the 61st District Court of Harris County in Texas. The dispute involved multiple claims and counterclaims stretching back to 2016 after former Cheniere CEO Souki was forced out of Cheniere the previous year by billionaire activist investor Carl Icahn. Souki went on to co-found Tellurian, which is developing the proposed Driftwood plant in Louisiana and multiple pipelines.

The court case related to projects in Louisiana proposed by Cheniere and Parallax Enterprises, a predecessor entity to Tellurian that was a business partner of Cheniere. Parallax was founded by Martin Houston, the former UK BG Group executive, and became involved in a business relationship with Cheniere. "Although this frivolous lawsuit was clearly an attempt to disrupt the hard work and success we are having at Tellurian, it never distracted us from our focus on building Tellurian's global natural gas business, beginning with

Driftwood LNG," said Souki. Cheniere had accused Parallax of failing to pay back a $46 million loan for developing LNG projects that Cheniere said Tellurian would ultimately benefit from.

Tellurian argued that those efforts, the proposed Live Oak LNG and Louisiana LNG facilities, were separate from its own Driftwood LNG venture. Souki was ousted from Cheniere followed disagreements over his expansion plans, including the Parallax projects. Within months of leaving Cheniere, Souki announced the founding of Tellurian with Martin Houston. Parallax was founded by the UK executive in late 2014 following discussions with the then-Cheniere CEO Souki about LNG projects. Souki's Driftwood plant is proposed for the west bank of the Calcasieu River, south of Lake Charles, and will have output of just over 26 million tonnes per annum when completed in 2023. This comprises five liquefaction Trains built in two phases and with each having output of 5.25 MTPA. Tellurian also signed an accord in September 2019 with the leading Indian LNG importer for the purchase of up to 5 MTPA from Driftwood, concurrent with an equity investment by the New Delhi-based company.

**TOTAL**, the French major, reported solid earnings in a lower-priced market place and reported progress on all liquefied natural gas project fronts from Russia to Africa and Australia. Overall LNG sales for 2019 rose by 57 percent to 34.3 million tonnes from 21.8MT in 2018. Fourth-quarter LNG sales increased 35 percent to 10.6MT versus 7.9MT in the prior-year quarter. Total also reported an average Japan-Korea Marker LNG price down 42 percent year-on-year from $5.80 per million British thermal units for the fourth quarter compared with the same three months of 2018 when it was $9.90 per MMBtu. "The Group had solid fourth-quarter results with cash flow of $7.4 billion, an increase of more than 20 percent compared to the fourth quarter of 2018, and adjusted net income was stable at $3.2Bln, despite a lower price environment," said Chairman and Chief Executive Patrick Pouyanné.

Total said it generated cash flow of $28.5 billion last year with income growth of $2.4Bln compared with 2018 and with positive contributions from all segments. "This performance was achieved despite the drop in oil prices of 10 percent and European gas prices of 38 percent, or a price environment down on average by about 20 percent," added Pouyanné. The group reported solid adjusted net operating income for the year of $11.8Bln, a decrease of 13 percent. In the Upstream segment the French operator reported , start-ups and ramp-ups including Yamal LNG in Russia and Ichthys LNG in Australia, Egina in Nigeria and Kaombo in Angola. These projects generated strong cash flow and fueled production growth of 9 percent for the year, with LNG growth of nearly 50 percent. The company also recorded the start-up of the Cameron LNG plant in Louisiana under Sempra Energy.

The Exploration & Production segment increased cash flow to $18Bln, despite the deterioration of the environment, with Integrated Gas, Renewables and Power (IGRP) posting an increase in LNG sales of nearly 60 percent and cash flow of $3.7Bln. The Downstream contributed stable cash flow of $6.6Bln, notably thanks to its non-cyclical activities and despite a decrease in refining and petrochemical margins to the order of 10 percent. Net investments rose to $17.4Bln and reflected in particular the strategy to strengthen LNG and deep offshore, as shown by the acquisition of Mozambique LNG and the launching of Arctic LNG 2 in Russia and the Mero 2 project in Brazil. More than one-third of the net investments were made in the IGRP segment, which leads the Group's low-carbon ambitions. The CEO noted that Total entered the gas and renewables market in India in partnership with the Adani Group and will build a 800-megawatt solar power plant in Qatar. ■

# Worley and consultancy Advisian outline concepts behind method of capturing the cold from LNG

*Technology applications can increase benefits of cold recovery and enhance LNG-to-power projects*

There are multiple concepts on how to "Capture the Cold" from LNG. These concepts include organic Rankine cycles, turbine inlet air cooling, export to cold processes such as air separation and dry ice manufacturing, and export for industrial refrigeration/air conditioning.

Some of these concepts have had limited implementations while others remain unrealized.

Minimizing capital and operating cost of each of the concepts is key to realizing the benefits of cold recovery.

We will focus on the details of how these concepts can be integrated in an LNG-to-power installation.

Some of these concepts can benefit from novel technology applications that simplify integration, reducing the cost and increasing the benefits of cold recovery.

The optimized cold-recovery concepts explored in this paper provide opportunities to enhance LNG-to-power projects.

The increased efficiency of the LNG utilization improves the economics of projects. In some cases, location specific secondary benefits will make the project much more attractive.

The liquefaction process chills natural gas from ambient temperature to approximately -162 C (-260 F). At these cryogenic temperatures the natural gas becomes a liquid which can be transported long distances economically.

However, this refrigeration process is very energy intensive. For the 392.9 MTPA of current capacity approximately 14,000 MW of compression capacity is required.

This represents a significant amount of power that is used to liquify the gas. This energy is not lost however.

In reality it is stored within the LNG. The extreme temperature difference between the LNG at -162 C (-260 F) and ambient conditions provide the opportunity to recover the energy when the LNG is warmed and vaporized.

Warming and vaporizing the LNG is required before it can be used as fuel in a power plant.

In many cases the cold energy that is stored in the LNG is simply wasted into the environment in the regasification process.

In the worst case additional LNG is burned only for heating the LNG. In this situation the energy to convert the gas to LNG is lost.

Energy recovery from the regasification process - "Capturing the Cold" - is a concept that simply makes sense.

It reduces the environment impact of power generation with LNG while increasing the efficiency of complete energy delivery cycle.

They are a wide variety of ways that have been proposed to "Capture the Cold".

For this discussion we will break the options for cold recovery into several categories.

Multiple technological options are available in each category. The categories are system enhancement, power generation and co-product generation.

The system enhancement technologies look to improve the CAPEX or OPEX performance of the LNG-to-power project using relatively simple integration concepts. The more complicated concept of making an addition power cycle will be discussed on its own.

Cooling turbine inlet air cooling and waste heat recovery are the main methods of system enhancement.

Turbine inlet air cooling uses the cold from the LNG to cool the air entering the gas turbine. This typically will increase the maximum power output of a given turbine.

This is especially useful in hot climates where peak power demand is driven by air conditioning loads. Without inlet air cooling the power output from the turbine will drop just as the demand for power is going up.

## Conditions

Inlet air chilling increases the CAPEX efficiency of the project by avoiding the need to oversize the power generation turbine just for a peak load on a hot day.

The gas turbine in a power plant produces a high temperature exhaust stream. Even after the heat recovery steam generator (HRSG) there is significant thermal energy available at a temperature higher than ambient.

Recovering this waste heat from the power generation system can increase efficiency of the project - both in capital investment and operating cost.

| CO-PRODUCT APPLICATIONS | | |
|---|---|---|
| Application | Description | Products |
| Air separation | Integration with a cryogenic air separaration unit | Nitrogen, Oxygen, Argon |
| Refrigeration and Cold Storage | Cold energy is exchanged to a transfer medium. The medium is then piped to near-by facility that need refrigeration. | Refrigeration |
| Dry Ice Production/Liquid $CO_2$ | Freezing $CO_2$ into solid form | Dry Ice (Solid CO2) or liquid $CO_2$ |
| Seawater Desalination | Freezing technology for the production of fresh water | Purified Water |
| Cryogenic Pulverization of Plastics and Wastes | Cooling the material to be crushed changes the material properties to permit efficient pulverization | Granular material |
| Liquid Air Energy Storage | The cold from LNG is used to liquefy air | Liquid Air - energy |
| Hydrogen Production | The cold from LNG gasification can be used to enhance Hydrogen production | Hydrogen |
| Natural Gas send-out | The regasification is sized to output gas to a supply network and not just the Power plant | Natural Gas |

**Figure:1. Co-product application for the cold recovery process**

The temperature difference between the cold LNG and the ambient or the turbine exhaust can be used to create an additional power cycle.

## Power generation

The organic Rankine cycle is the most frequently discussed option; however, it is not the only possible cycle.

The power cycles, in general, work by vaporizing a working fluid at high pressure with a heat source, expanding the vapor to generate power, condensing the vapor at low pressure and then pumping the fluid back to high pressure to restart the cycle.

Power generation cycles have been studied in depth using a variety of cycles. In a review that compared the Rankine, Brayton and Kalina cycles and combined cycles results of the thermodynamic optimum depended on the temperature of the heat source that was selected (Gomez, Garcia, J. Romero Gomez, & Carril, 2014).

Many other options have also been examined (Zhang & Tang, 2012), (Ferreira, Catarino, & Vaz, 2017) (Bruno, Bevilacqua, & Arcuri, 2017) (Kime & Kim, 2016) (Lee & Kim, 2015).

This list is not exhaustive, however despite the large number of articles looking at the thermodynamics of the power cycles there a relatively few that look at the overall economics.

One paper that did such a study concluded that power generation using cold was economical however the best economic option was a relatively simple and less efficient cycle (Dutta, Karimi, & Farooq, 2018).

**Co-product generation:** Co-Product generation seeks to recover the cold energy into a saleable product directly or improves the efficiency of a co-product generation process. This should create an economic benefit for the overall LNG-to-power project.

There are a wide variety of ideas that have been considered (Bruno, Bevilacqua, & Arcuri, 2017) (Kar-wai, 2006) (Otsuka, 2006) (Peng, She, Nie, Li, & Ding, 2018).

**Methods of evaluation:** We have presented several options for potential additions to an LNG-to-power project that could improve the capital and operating efficiency. Now the task at hand is to establish a framework for evaluation of these options.

**Thermodynamics:** The thermodynamics of cold recovery is covered extensively in scientific publications. The thermodynamic calculations can be complicated but are invariant - not subject to market forces.

These thermodynamics will always look at the optimum energy or exergy efficiency. Exergy is a thermodynamic concept that looks at the maximum amount work that can be extracted from a system by bringing it into equilibrium with its environment.

For a non-reactive system this is the difference in temperature and pressure

| OBSERVATIONS | | | |
|---|---|---|---|
| | System enhancement | Power generation | Co-product Generation |
| Scalability | Easier to scale to small sizes economically | Economics become more available as size increases | Depends on the market for the co-product |
| Power generation to regasification distance | The regasification unit must be relatively close to the power generation unit | Power generation cycles that do not integrate with the power plant are available (Using a Floating Storage Regas Unit with onshore generation is not a problem) | Proximity to the co-product market can be more important |
| Operational complexity | Low | Medium to high- depending on complexity of the cycle(s) used | Potentially very high- Dealing with variable LNG flow due to power demand while keeping products or specification or matching cold export requirements require careful consideration |
| Regulatory | Generally, not a problem provided there are no barriers to LNG-to-power as a concept | Generally, not a problem provided there are no barriers to LNG-to-power as a concept | More likely to be problematic since Power is often regulated as a utility. Attempting to sell a product other than power may be difficult |
| Economic Potential | Incremental Improvement | | Depends heavily on the local markets for the co-product. Highest potential if the markets are favourable. |
| Environmental Improvement | Smaller efficiency gains result in less improvement than other options | Increased overall efficiency reduces emissions | Increased energy utilization reduces total emissions |

**Observations made in the paper about capturing the cold**

between the fluid of interest and the environment.

Since LNG is very cold it has a large amount of exergy. Many of the published papers look at the exergy efficiency of their process or thermal cycle.

## Economics

Although researching more thermodynamically efficient processes is interesting, project developers are actually looking for the best economic returns, not the best thermodynamics.

Economic evaluations are not as widely published. This is likely due to the large number of assumptions and variables that can impact the results.

Typically, a conceptual screening study will be done early in the project. In this early stage the parameters for economics analysis will be defined.

This can include items such as: market studies, regional or local social and regulatory studies and construction cost indexing.

## Observations

Making a one-size fits all statement on which options will be the best for any LNG-to-power project is simply not possible due to many variables that need to be considered for a real project and not a theoretical one.

There general observations than can help narrow the options. Examples:

## Senboku LNG

The Senboku LNG Terminal in Japan is a facility that has had a long history of LNG cold recovery. The facility has used Air Separation, Power Generation, CO2 liquification, Boil Off Gas Liquefaction with thermal storage, and cold export to industrial users.

The terminal was originally only an LNG receiving terminal however it has evolved to have both power generation and cryogenic businesses.

So, although it is not a green field LNG-to-power project it demonstrates that under the correct conditions these technologies can be economically feasible (Otsuka, 2006).

## Eco-Energies Barcelona, Spain

The Eco-Energies district heating and cooling plant utilizes waste cold from the nearby LNG terminal to recover up to 30MW of chilling. This provides cooling for the area around the port in Barcelona.

This again is not a specific LNG-to-power project but demonstrates the feasibility of these concepts when the suitable drivers are in place.

## New technologies

Integrated LNG regasification using a heat pipe technology-based vaporizer. This technology aims to improve the economics of the system enhancement category.

The primary advantage is the simple design with no additional rotating equipment (Schroeder & Rizopoulos, 2018).

Power cycle optimization research continues to produce theoretical performance gains. Active areas of reached include optimized selection of the working fluid and in investigation into multicomponent fluids.

These theoretical gains are the first step to seeing actual gains in operating equipment.

Liquid Air Energy Storage has seen academic interest as an environmentally friend large-scale storage technology.

Because of the cold temperatures needed it has the potential to integrate well with LNG gasification. There is still considerable work to generate an economic and operational system (Peng, She, Nie, Li, & Ding, 2018).

**Attempts to make LNG "greener" by including carbon capture:** An example is provided in a recent published paper that integrates power production with sewage treatment using supercritical CO2 extraction (Xiang, Cai, Guan, Liu, & Yixiao Han, 2019).

Although this is far from being commercially ready it shows possible future options that will be attractive as carbon emissions are pushed lower.

## Summary

The cold energy - or exergy in thermodynamic terms - that is available in LNG is currently mostly a wasted resource.

This paper has reviewed a new of proven technologies for recovery of this waste cold as well as potential new technologies. Evaluation of these technologies is best done with the context of the specific application.

Regional difference in regulations, market pricing and required scale will drive the economic analysis to different conclusions.

The best economic solution may not be the one with the highest thermodynamic efficiency - which is the information most widely available on most options. ■

*The article is based on extracts from a conference paper presentation called "LNG to Power - Capturing the Cold" by Scott Schroeder, Senior Technical Consultant of Advisian (Worley Group) of Houston, Texas and John Rizopoulos, Senior Vice President of Worley in Houston.*

*Australian energy engineer Worley offers a wide range of consulting and advisory services, through its subsidiary Advisian. The firm has 3,100 consultants across 25 countries integrating strategy, management and technical consulting expertise.*

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# Forecasting of boil-off gas production and LNG ageing in Floating Storage and Regasification Units

*When no regasification takes place over long periods, boil-off gas production leads to significant changes*

Boil-off gas (BOG) is an inherent attribute in LNG storage facilities and its magnitude has a significant impact in the Terminal´s economic performance.

In Floating Storage and Regasification Units (FSRUs) there are different BOG pathways including internal consumption for power generation, recondensation with LNG at the regasification trains (heat exchangers) and combustion at the Gas Combustion Unit (GCU) of all excess BOG.

## Characterized

These consumptions are somehow characterized given the FSRU's manufacturer table of expected BOG production under different regasification flows and heat transfer rate for every storage tank.

On the other hand, SPEC LNG was conceived to ensure natural gas supply to Colombia´s main thermal electric generators. Its main role is to offer reliability to the South American country's hydro-dependent electrical system.

Due to the low predictable and non-continuous thermal generation dispatch, a challenging condition occurs on our intermittent regasification operation.

Additionally, when no regasification takes place over long periods of time, BOG production leads to significant changes in the composition of the stored LNG (ageing) and cannot be easily measured since chromatography equipment is installed in the regasified outlet stream.

Such changes in composition may even lead to stored LNG not meeting regulatory requirements.

## Published

In publications. it is possible to find several works of authors who have designed and developed LNG ageing models: Migliore et al. (2015) proposed an LNG ageing model by integrating a rigorous thermodynamics model for vapor-liquid equilibrium (VLE) and a realistic heat transfer model.

Later Migliore et al. (2017), based on its previous work, developed a model including the contribution of additional key parameters on LNG storage.

Also, LNG evaporation (BOG) and LNG composition change during its transportation onboard LNG carriers has also been widely studied.

Advanced prediction models for BOG generation and LNG ageing have been developed: in 2007, the MOLAS Project presented a software for the analysis of LNG weathering based on ship characteristics [Miana M. et al. (2010)].

Later, Dimopoulos G.G. & Frangopoulos C.A. (2008) developed a dynamic model for BOG generation when LNG is being transported on vessels between ports.

Then Krikkis R.N. (2018) developed an LNG aeging model based on a non-equilibrium thermodynamic and heat transfer model developed on experimental data for LNG ship transportation.

Given the complexity of the works mentioned above, the importance of developing a user-friendly computational tool based on a common and daily-used software such Excel for predicting BOG generation and LNG composition after long periods of no regasification became relevant.

## Simulation models

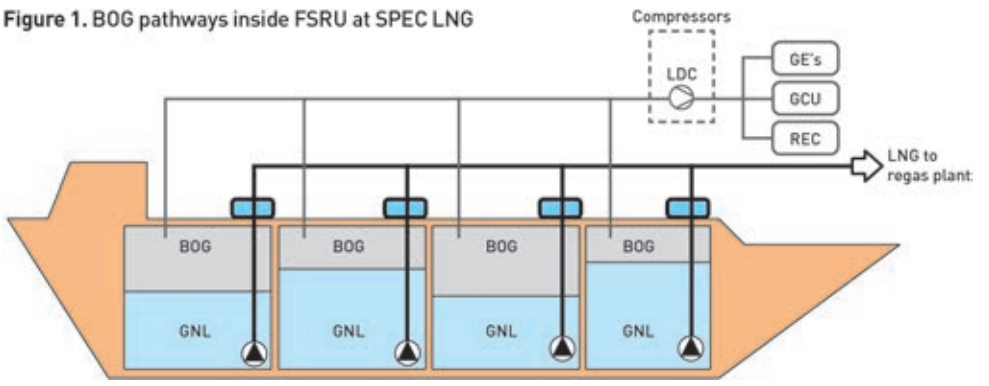
Based on FSRU's manufacturer information and available operational data, two simulation models were developed in order to meet a Terminal's needs.

The BOG prediction model aims to forecast the amount of BOG that will be generated given specific operating conditions.

It provides the user with further and better information for decision making in intermittent dispatch operations. It is a useful tool for determining the most appropriate send-out profile throughout the day and minimizing BOG burning on the GCU.

The model is based on FSRU manufacturer´s performance information and incorporates additional variables such as number of tanks and a set of operating conditions, in order to determine the quantity of BOG in both mass and energy on a daily basis.

**Figure 1.** BOG pathways inside FSRU at SPEC LNG




## Special considerations

In order to include the importance of operational experience and data collected throughout the Terminal's operational time, the model contains features that allows the user to modify base performance information according to the reality of the operation. The operational features included on the model are:

**a) Number of tanks (NTK):** available information for BOG generation only considers the FSRU to be operating with all four (4) cargo tanks. This new feature calculates a factor (F) that considers not only the number of tanks in service, but also which tanks are in service and the specific contribution to BOG generation of each specific tank.

**b) Hourly regasification profile:** this feature offers an enhanced result given the number of variations on the send-out rate for a daily dispatch program. FSRU's BOG handling capacity changes accordingly to the send-out rate.

**c) Tank pressure and LNG composition:** these two parameters help to get a better approach of the BOG properties required to calculate the energy contained on the BOG mass estimated by the FSRU's performance data. Therefore, the model does not need to assume BOG composition as pure methane or as a fixed nitrogen-methane mixture (GIIGNL, 2017).

On the other hand, the model has a limitation regarding LNG temperature for the simulation. It estimates BOG generation by considering an LNG storage temperature of -159°C and -160°C.

The model executes the calculation in five (5) steps:

1. Inputs definition:
   a) Number and identification of cargo tanks in operation (with LNG).
   b) Operating condition: with or without STS operation.
   c) Regasification profile.
   d) LNG composition
   e) Operating pressure
2. Estimation of theoretical BOG production based on FSRU manufacturer´s performance information, regasification profile and FSRU operating conditions.
3. Based on LNG composition and operating conditions (P and T), BOG composition is calculated by means of Antoine´s equation and Raoult´s law.
4. BOG properties (ρBOG and GHVBOG) are estimated based on calculated composition with ISO-6976
5. Calculation of energy based daily BOG production

## Ageing model

The LNG ageing model is a useful tool for predicting LNG composition, GHV and WI for cargoes that will be stored for long periods of time (up to 6 months) and no send-out is foreseen.

The tool helps to predict whether the LNG still complies with the Terminal and national requirements regarding its composition and properties.

The model is based on FSRU manufacturer´s performance data and operational information resulting on richer and more accurate results.

Among the operational features included on the model, variables such as specific tank performance, tank

pressure and phase equilibrium are considered.

The operational features included on the model are:

**a) Tank specific performance:** this feature allows having a better approach to the LNG ageing by including BOG generation depending on the specific tank under evaluation. According to operational experience, this is a valuable feature since each tank has different performance and, therefore, a different ageing rate.

**b) Vapor-liquid equilibrium:** since the LNG-BOG are in equilibrium, this feature allows the model to predict a more adjusted LNG composition by not assuming a fixed BOG composition, but instead, by calculating BOG composition for every simulated day.

**c) Tank operating pressure:** it is a feature required for performing the phase equilibrium and BOG composition estimation calculations.

On the other hand, the model has a limitation regarding LNG temperature for the prediction. It estimates phase equilibrium considering an LNG storage temperature of -160°C.

## Calculation process

The model executes the calculation in seven (7) steps:

1. Inputs definition:
   a) Initial and final date for the projection.
   b) Initial LNG composition.
   c) Initial LNG volume.
   d) Set BOR (depends on the tank)
   e) Operating pressure

## BOR model

Both BOG Prediction and LNG Ageing models uses manufacture's performance information as assumptions to perform their calculations.

A key parameter included is BOR which establishes an operating baseline to the BOG production based on design and manufacturing specifications.

Manufacturers commonly provide a reference value at specific conditions for the LNG stored and vessel inventory (typically at 98% of total capacity).

This value is considered constant for the overall operation despite the different procedures or scenarios implemented during daily routines.

When physical and thermodynamic considerations are lay out, BOG production is intrinsically related to heat transfer phenomena and internal pressure and temperature control procedures.

As the vessel depletes, its thermal inertia is reduced because of lesser natural gas available to gain heat from surroundings and, therefore, BOR is expected to increase.

BOR is a critical parameter related to efficiency and optimal performance and its monitoring is critical to operations and decision making.

A detailed heat transfer analysis is complex as it depends on constructive parameters of LNG vessels such as volumetric dimensions, heat transfer properties of materials, among others.

Moreover, this is proprietary information and its access to LNG operators like SPEC LNG is limited. Hence, a data-driven approach to BOR analysis using historical information is conducted.

A multivariate statistical analysis over 100 operating variables is carried out and the various conclusions are obtained (see original paper).

The preliminary statistical analysis confirmed the initial hypothesis regarding the possible relationship between BOR and the stored LNG volume (see graphic in the paper).

Finally, a regression model is estimated based on the historical dataset available and it is developed for every vessel unit at SPEC LNG facilities.

Statistical assumptions are confirmed with satisfactory outcome. To update the BOG Production and LNG Ageing models, a BOR update step is added, and it shall be executed prior any new iteration.

TABLE 2A. CASE STUDY 1: PROJECTION AFTER 37 DAYS OF NO SEND-OUT.

| Component | Initial measurement | Final measurement | Projection | Absolute error |
|---|---|---|---|---|
| | [% mol] | | | |
| Methane | 96,7776 | 96,6767 | 96,5744 | 0,106% |
| Ethane | 2,9048 | 2,9920 | 3,0992 | 3,583% |
| Propane | 0,2412 | 0,2569 | 0,2573 | 0,156 |
| i-butane | 0,0322 | 0,0342 | 0,0344 | |
| n-bustane | 0,0274 | 0,0287 | 0,0292 | |
| i-pentane | 0,0037 | 0,0039 | 0,0039 | |
| n-pentane | 0,0011 | 0,0013 | 0,0012 | |
| Hexane | 0,0004 | 0,0007 | 0,0004 | |
| Nitrogen | 0,0116 | 0,0056 | 0,0000 | |
| GHV [Btu/scf] | 1.039,35 | 1.040,36 | 1.041,08 | 0,069% |
| W.I. [Btu/scf] | 1.373,89 | 1.374,49 | 0,001% | 0,001% |

## Case study

The case studies presented on this section are based on actual operating data of SPEC LNG. At the terminal, SPEC LNG counts with a permanently moored FSRU with the following LNG storage characteristics: - Number of tanks: four (4) - LNG storage volume: 170.000m3 - Tank type: MARK III with membrane - Maximum theoretical BOR: 0,15% Two different case study approaches will be presented: (i) for the BOG model and (ii) for the LNG aging model.

Case study for BOG prediction model: The FSRU permanently moored at SPEC LNG jetty can operate with send-out rates between 50 and 400 MMscf per day.

Also, at any send-out rate equal or above 80 MMscf per day, all excess BOG can be handled meaning that no BOG is burnt on the GCU.

Taking this into account and considering intermittent natural gas dispatch, on this paper the scenario of regasifying 40 MMscf on one day will be analyzed.

Due to the wide operating range for gas send-out, many dispatch profiles are available for the scenario to be analyzed.

The results will present the accuracy of the tool given the real send-out profile of the gas day and determine the most suitable dispatch program by minimizing the BOG on GCU.

The difference between the amount of real BOG and predicted BOG considering the same send-out profile does not exceeds 3.87%.

Nonetheless, despite the error, the tool gives the user further information to take a better decision when planning the send-out profile for the day given a gas volume requirement for the day.

## Case study for LNG ageing

As a case study for this model, two LNG cargoes stored on different cargo tanks are analyzed on periods of no send-out. On both cases, LNG composition is measured during regasification on the initial and final dates of the analysis.

Based on this information, LNG aging model accuracy will be quantified based on five key parameters for SPEC LNG: main hydrocarbon composition (methane, ethane and propane), GHV and Wobbe Index.

A definition of these key parameters is based on national regulation requirements for natural gas transportation on the local gas grid.

Case study number 1 corresponds to a LNG cargo stored for 37 days in one tank at its 87% of capacity. Absolute error for key parameters does not exceed 0,16%, except for ethane content which shows a large error.

Nonetheless, prediction capacity of natural gas properties such as GHV and Wobbe Index is very accurate, showing errors lower than 0.07%.

On the other hand, case study number two corresponds to an LNG cargo stored for 105 days in one tank at its 98% of capacity.

The results are as accurate as for case study 1, where the absolute error for key parameters does not exceed 0.13%. Although this time, results show a better fit for the compositions than for the properties.

Notwithstanding this, identified absolute error for GHV and Wobbe Index are within a tolerable range.

## Conclusions

Presented models were built on Excel, a daily-used software, allowing the user to access enhanced information about a condition, BOG generation or LNG ageing, on basically any computer and with an easy, simple tool.

Nonetheless, despite its simplicity, the results of the developed models have shown that they present a very good fit when resembling process data.

This means that the tools can be used for monitoring, prediction and even for operative and commercial decision making.

As both BOG prediction model and LNG ageing model were developed based on specific operational data and the FSRUs' manufacturer information, variables can be parameterized to fit different conditions and adjusts made to the models for any specific terminal conditions. ■

*This article is based on extracts from a paper entitled "Modeling and Forecasting of Boil-off gas Production and LNG Aging in Floating Storage and Regasification Units under Intermittent Dispatching Operating Conditions". The authors from Sociedad Portuaria El Cayao S.A. E.S.P. (SPEC LNG) and Promigas S.A. E.S.P are: Andres F. Bustillo, Nestor C. Consuegra, Horacio Pinzon, Isaac Diaz, Jose M. Castro and Marco Sanjuan.*

# Global LNG maritime fuel body Sea-LNG reports on expanding gas-powered fleets and bunkering

*All shipping sectors have newbuilds on order and leading ports have fuel infrastructure*

As recognition of the business case for LNG as a marine fuel grows, so too does the order book for LNG-fuelled vessels, across all sectors.

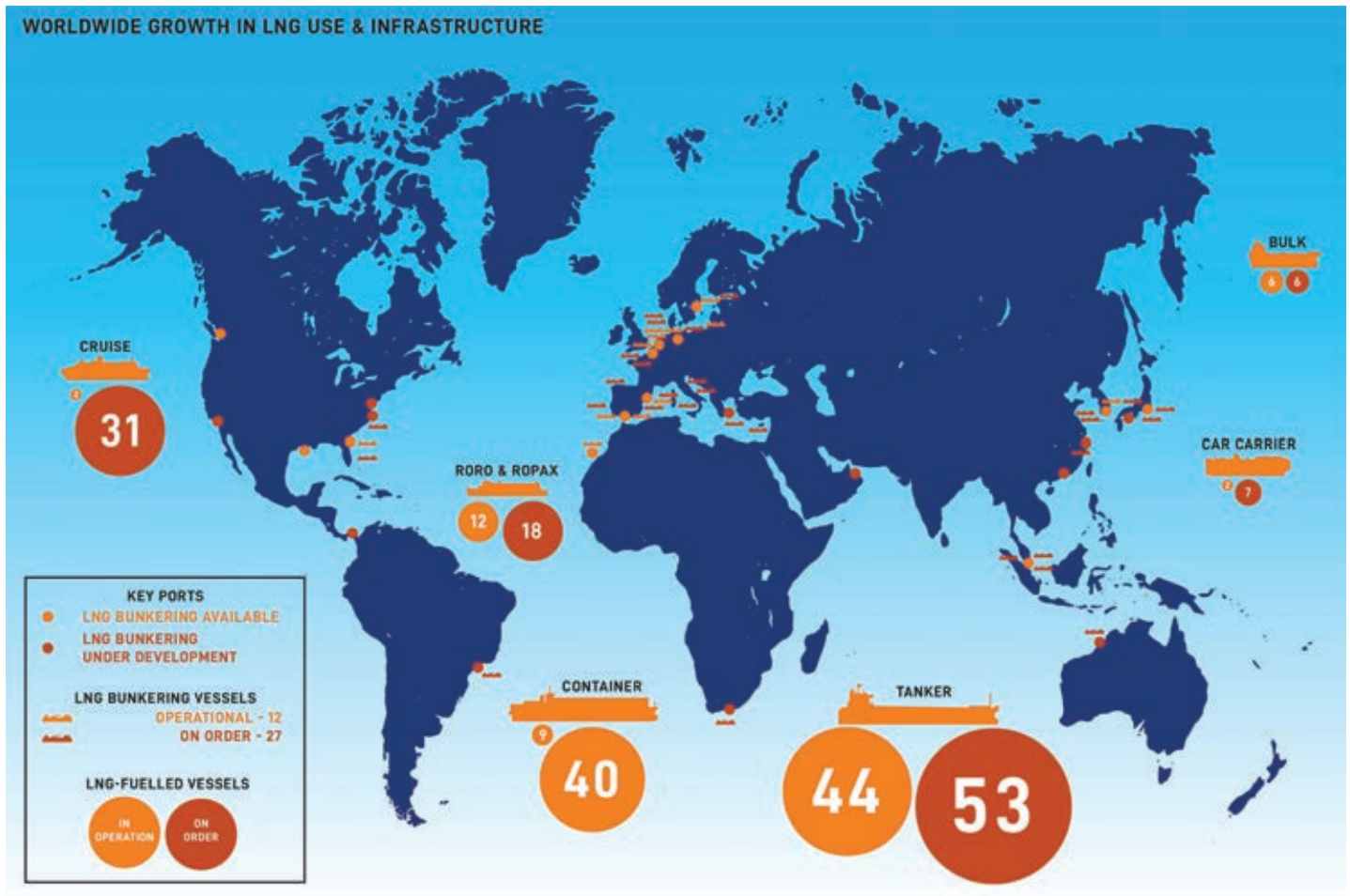
In June 2019 there were 163 LNG-fuelled ships in operation (excluding over 500 LNG carriers) and a further 155 ships on order.

## Increase

As of February 2020, these numbers have increased to a total of 175 LNG-fuelled ships in operation, with 203 on order and a further 141 LNG-ready vessels in operation and sitting on the order books.

Last year, SEA-LNG published three key Investment Case Studies commissioned from independent simulation and analytics expert Opsiana.

Each study produced a positive result for LNG investment, evaluating returns under current legislation: were future legislation to impose additional financial burdens as a result of carbon-dioxide emissions, the investment case for LNG against oil-fuels would be strengthened further.




**The global growth of LNG-powered vessels and bunkering infrastructure**

## Infrastructure

In terms of expanding the LNG bunkering infrastructure from a well-developed LNG bulk infrastructure already well placed and aligned to supply the world's major shipping lanes, dramatic progress has been made on a global scale.

DNV GL forecasts for 2050 show up to 41 percent of marine fuel being LNG.

In early 2019 there were just six bunkering vessels around the world. As of February 2020 there are 12 in operation with a further 27 on order and / or undergoing commissioning.

Today there are active bunkering capabilities or plans to provide LNG bunkers in numerous locations around the globe, including nine out of the world's top 10 ports.

Port infrastructure is improving all the time and key regions are investing heavily into the bunkering infrastructure that supports LNG as a marine fuel in areas including Europe, North America, Japan and Singapore.

The container investment case was the first study by Opsiana to support shipowners and operators in analysing their investment opportunities in an informed way.

## Containers

The study analysed the case of a newbuild 14,000 TEU container vessel operating on an Asia-US West Coast (USWC) liner routing and compared six fuel pricing scenarios.

The study showed that for this vessel type, on this trade route, LNG as a marine fuel delivers the best return on investment on a net present value (NPV) basis over a conservative 10-year horizon, with fast payback periods ranging from one to two years.

Other examples that illustrate progress in this sector include:

The total number of LNG-fuelled container ships on order or already operating add up to 49 according to estimates from DNV GL, making them the largest deep-sea LNG-fuelled ship type after LNG carriers.

- In September, CMA CGM launched the world's largest LNG fuelled container ship, the 23,000 TEU CMA CGM Jacques Saadé. By 2022, this company will have 20 LNG-powered container vessels: eight others at 23,000 TEU, five at 15,000 TEU and six at 1,400 TEU of which three are in operation with Containerships.
- In February 2019, Hapag-Lloyd announced it will undertake the world's first conversion of a container ship to LNG. The retrofit of the "Sajir" will take place in 2020, and presents the opportunity for its 16 LNG-ready sister ships to also undergo conversion.
- Matson took delivery of its newest LNG dual-fuel vessel, the largest combination container/ro-ro ship ever built in the US, in December 2019.

## PCTC

The second in the series of investment case studies was for newbuild Pure Car and Truck Carriers (PCTC) on Pacific and Atlantic trade lanes.

The study considered two PCTC trading scenarios using a 6,500 Car

Equivalent Unit (CEU) vessel on the Atlantic Trade and an 8,000 CEU vessel on the Pacific Trade.

The study indicated that LNG as a marine fuel delivers the best return on investment on a NPV basis over the same conservative 10-year horizon, with fast payback periods ranging from one to three years on the Atlantic Trade and from less-than-one year to two-years on the Pacific Trade.

Other examples that illustrate progress in this sector include:

- Siem Car Carriers has officially launched the "Siem Confucius" and "Siem Aristotle" - the first, trans-Atlantic PCTCs to operate full-time on LNG. The vessels will transport cars for the VW Group between Europe and China.
- United European Car Carriers (UECC) signed a contract to build three new hybrid-powered, LNG-fuelled PCTCs to be operating by 2022. The new ships will be equipped with a battery hybrid LNG propulsion system which will place UECC beyond IMO's target for a 40 percent reduction in carbon intensity by 2030.
- In September, SEA-LNG Member NYK, one of UECC's two parent companies, announced an order for the world's largest LNG-fuelled PCTC.

The ship is scheduled to be delivered in 2020 and will be the first large LNG-fuelled PCTC to be built in Japan.

## Tankers

The third, and latest, investment case study demonstrates clear benefits of LNG as a marine fuel for a newbuild 300,000 dwt VLCC on the Arabian Gulf to China trade route, in comparison with other alternatives currently available and scalable to the shipping industry across three fuel pricing scenarios.

The study clearly indicates that LNG delivers a strong return on investment on a NPV basis over a conservative 10-year horizon, with compelling paybacks from three to five years.

Moreover, recent public announcements by COSCO which state a $6 million additional investment for installing an LNG-propulsion system is $10 million less than that modelled by Opsiana, which if comparable to their study would make the investment case for LNG-propulsion of VLCC's much stronger.

Examples that illustrate progress in this sector include:

- The Cosco Shipping Energy Transportation (CSET) order for a dual-fuel VLCC newbuilding that will use LNG as its marine fuel. This 319,000 dwt crude tanker is due for delivery in 2020 having been ordered at Dalian Shipbuilding Industry Co (DSIC) two years ago.
- South Korean shipbuilder Samsung Heavy Industries (SHI) will build 10 LNG-powered crude tanker vessels. The order was placed by an unnamed "Oceanian" customer and the 113,000 dwt LNG-fuelled tankers will be delivered by January 2022.
- Shell Tankers (Singapore) Private Ltd has agreed a long-term deal to charter a fleet of 10 LNG dual-fuel Aframax crude oil tankers from Sinokor Petrochemical Co Ltd, which expects to take delivery of them from Samsung Heavy Industries in South Korea in 2021. Separately, Shell agreed long-term charters for four new LNG dual-fuel oil products tankers, with delivery of the vessels expected from 2021.
- Gothia Tanker Alliance's fifth LNG-fuelled vessel, the "Fure Ven", was delivered - part of the six-vessel series ordered by Alliance members Furetank, Älvtank and Erik Thun. All the 16,000 dwt tankers are equipped with dual-fuel engines for LNG operation, featuring ice class 1A.
- Gas4Sea partners ENGIE, Mitsubishi Corporation and NYK have ordered four, dual-fuel crude shuttle tankers vessels which are scheduled to come into service in early 2020 and will be operated by Equinor in Northern European seas.
- MISC, the shipping division of Malaysia's state oil firm Petronas, announced its commitment in December 2019 to convert half of its 60-strong oil tanker fleet to run on dual-fuel LNG by 2030.

## Cruise and Ferry

The cruise and ferry sector was an early adopter of LNG as a marine fuel and continues to evolve. As highlighted last year, the cruise sector has recognised the clear environmental benefits of LNG as a marine fuel, and with high capital costs for cruise vessels the economic investment case is even stronger.

Carnival's "AIDAnova" commenced its operation life at the end of 2018 and has been operating smoothly powered by LNG throughout 2019. Carnival's second LNG-powered cruise vessel the "Costa Smeralda" entered service in 2019.

Examples of progress include:

- MSC Cruises started construction on "MSC Europa", its first of five liquefied natural gas (LNG)-powered cruise ships that will come into service between 2022 and 2027.
- Disney Cruise Line has announced plans to build three additional LNG-fuelled cruise ships. Three 135,000 gt LNG-fuelled ships are already under construction at Meyer Werft and scheduled for completion in 2021, 2022 and 2023. The first of these, "Disney Wish", is scheduled for delivery in late 2021 and is expected to set sail beginning in January 2022.
- Finnish shipbuilder Meyer Turku hosted a naming and steel-cutting ceremony for Costa Cruises' second LNG-powered newbuild. The "Costa Toscana", will be delivered in 2021. Float-out of LNG-fuelled "Costa Smeralda" took place in March, with delivery of the vessel taking place on 5th December.
- Canadian ferry operator, BC Ferries plans to build five LNG-fuelled ferries as part of its fleet renewal drive. It has two Spirit Class units already running on LNG.
- Princess Cruises has signed the final contracts for the construction of two LNG dual-fuel cruise ships with Fincantieri. The 175 000 gt cruise ships will be delivered in late 2023 and in Spring 2025.

## Bulk

While the bulk sector may be a little behind obvious early adopters in terms of uptake due to its tramp nature, there is now a clear direction in this segment for liner-type operations as well, for example:

- BHP has released the world's first bulk carrier tender for 12 LNG-fuelled vessels for the transport of 27 million tonnes of its iron ore from Australia to North Asia. These will be able to transport the equivalent of about 10 perdent of BHP's iron ore sales.
- H-Line shipping has ordered the construction of two,180,000 dwt LNG-fuelled Newcastlemax bulk carriers from South Korean shipbuilder Hyundai Samho Heavy Industries. The vessels are expected to be delivered in 2022, and be deployed on a route between South Korea and Australia. ■

LNG
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# World LNG Carrier Fleet

| LNG carrier | Capacity $m^3$ | Owned or Ordered by | Builder | Delivery Date | Flag | Power Plant | Cargo System | No. of tanks | Ship built for Export plant |
|---|---|---|---|---|---|---|---|---|---|
| Aamira | 266,000 | QGTC | Samsung | Dec-10 | Liberia | DRL | GTT | 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 | GTT | 4 | Nigeria LNG |
| Adam LNG | 162,000 | Oman LNG | Hyundai | Dec-14 | Marshall Is. | DFDE | GTT | 4 | Oman LNG |
| Adriano Knutsen | 180,000 | Knutsen | Hyundai | Jul-19 | Spain | MEGI-DF | GTT | 4 | charter |
| Al Aamriya | 210,100 | J5 Consortium | Daewoo | Feb-08 | Marshall Is. | DRL | GTT | 4 | Qatargas |
| Al Areesh | 151,700 | Teekay LNG | Daewoo | Jan-07 | Qatar | S | GTT | 4 | Ras Gas II |
| Al Bahiya | 210,185 | QGTC | Samsung | Oct-09 | Liberia | DRL | GTT | 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 | GTT | 4 | RasGas II |
| Al Dafna | 266,000 | QGTC | Samsung | Oct-09 | Marshall Is. | LR DRL | GTT | 4 | Qatar-Atlantic |
| Al Deebel | 145,000 | Peninsular LNG | Samsung | Dec-05 | Bahamas | S | GTT | 4 | Qatargas |
| Al Gattara | 216,200 | OSG/Nakilat | Hyundai | Oct-07 | Marshall Is. | DRL | GTT | 4 | Qatargas II |
| Al Ghariya | 210,100 | ProNav | Daewoo | Feb-08 | Bahamas | DRL | GTT | 4 | Qatargas |
| Al Gharaffa | 216,200 | OSG/Nakilat | Hyundai | Jan-08 | Marshall Is. | DRL | GTT | 4 | Various |
| Al Ghashamiya | 216,000 | QGTC | Samsung | Mar-09 | Liberia | DRL | GTT | 4 | Qatar-Atlantic Basin |
| Al Ghuwairiya | 261,700 | QGTC | Daewoo | Aug-08 | Marshall Is. | DRL | GTT | 5 | Qatar-Atl'c Basin |
| Al Hamla | 216,000 | OSG | Samsung | Feb-08 | Marshall Is. | DRL | GTT | 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 | GTT | 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 | GTT | 4 | RasGas |
| Al Kharaitiyat | 216,200 | QGTC | Hyundai | May-09 | Liberia | DRL | GTT | 4 | Qatargas III |
| Al Kharaana | 210,000 | QGTC | Daewoo | Oct-09 | Marshall Is. | DRL | GTT | 4 | Qatargas IV |
| Al Kharsaah | 217,000 | Teekay | Samsung | May-08 | Bahamas | DRL | GTT | 4 | RasGas III |
| Al Khattiya | 210,000 | QGTC | DSME | Oct-09 | Marshall Is. | DRL | GTT | 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 | GTT | 4 | RasGas |
| Al Mafyar | 266,000 | OSG/Nakilat | Hyundai | Oct-07 | Marshall Is. | DRL | GTT | 4 | Qatargas II |
| Al Marrouna | 151,700 | Teekay | Daewoo | Nov-07 | Bahamas | S | GTT | | Ras Gas I |
| Al Mayeda | 266,000 | QGTC | Samsung | Jan-09 | Liberia | DRL | GTT | 5 | Qatar-US/Var. |
| Al Nuaman | 210,000 | QGTC | DSME | Dec-09 | Marshall Is. | DRL | GTT | 4 | Qatargas IV |
| Al Oraiq | 210,000 | J5 Consortium | Daewoo | Apr-08 | Marshall Is. | DRL | GTT | 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 | GTT | 4 | Qatar-Atlantic |
| Al Ruwais | 210,100 | ProNav | Daewoo | Nov-07 | Germany | DRL | GTT | 4 | Qatargas II |
| Al Sadd | 210,100 | QGTC | Daewoo | Mar-09 | Liberia | DRL | GTT | 4 | Qatar-Atlantic Basin |
| Al Safliya | 210,100 | ProNav | Daewoo | Dec-07 | Bahamas | DRL | GTT | 4 | Qatargas II |
| Al Sahla | 216,200 | J5 | Hyundai | Jun-08 | Japan | DRL | GTT | 4 | Ras Gas III |
| Al Samriya | 261,700 | QGTC | Daewoo | Sep-08 | Marshall Is. | DRL | GTT | 5 | Qatargas II |
| Al Sheehaniya | 210,100 | QGTC | Daewoo | Feb-09 | Liberia | DRL | GTT | 4 | Qatar-Atlantic Basin |
| Al Shamal | 217,000 | Teekay LNG | Samsung | Jun-08 | Qatar | DRL | GTT | 4 | RasGas |
| Al Thakhira | 145,000 | Peninsular LNG | Samsung | Sep-05 | Bahamas | S | GTT | 4 | Qatargas |
| Al Thumama | 216,000 | J5 Consortium | Hyundai | Apr-08 | Japan | DRL | GTT | 4 | Rasgas |
| Al Utouriya | 215,000 | J5 | Hyundai | Sep-08 | Panama | DRL | GTT | 4 | RasGas |
| Al Utourma | 215,000 | J5 | Hyundai | Sep-08 | Panama | DRL | GTT | 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 | GTT | 4 | Brunei LNG |
| Amanl | 154,800 | Brunei-Shell | Hyundai | Nov-14 | Brunei | DFDE | GTT | 4 | Brunei LNG |
| Aman Bintulu | 18,928 | Perbadanan / NYK Line | NKK Tsu | Oct-93 | Malaysia | S | GTT | 3 | Petronas |
| Aman Hakata | 18,800 | Perbadanan / NYK Line | NKK Tsu | Nov-98 | Malaysia | S | GTT | 3 | Petronas |
| Aman Sendai | 18,928 | Perbadanan / NYK Line | NKK Tsu | May-97 | Malaysia | S | GTT | 3 | Petronas |
| Arctic Aurora | 160,000 | Dynagas | Hyundai | Jul-13 | Marshall Is. | DFDE | GTT | 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 | GTT | 4 | Brunei LNG |
| Arwa Spirit | 165,000 | Teekay LNG | Samsung | Sep-08 | Marshall Is. | DFDE | GTT | 4 | Various |
| Aseem | 154,850 | K Line-Petronet | Samsung | Nov-09 | Malta | S | GTT | 4 | Qatar-India |
| Asia Endeavour | 160,000 | Chevron | Samsung | Dec-14 | Bahamas | DFDE | GTT | 4 | Various |
| Asia Energy | 160,000 | Chevron | Samsung | Sept-14 | Bahamas | DFDE | GTT | 4 | Various |
| Asia Excellence | 160,000 | Chevron | Samsung | Sept-13 | Bahamas | DFDE | GTT | 4 | Various |
| Asia Venture | 160,000 | Chevron | Samsung | Sept-17 | Bahamas | DFDE | GTT | 4 | Various |
| Asia Vision | 160,000 | Chevron | Samsung | June-14 | Bahamas | DFDE | GTT | 4 | Various |

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| Bahrain Spirit | 173,000 | Teekay | Daewoo | Sept-18 | Bahamas | DFDE | GTT | 4 | Various |
| Barcelona Knutsen | 173,400 | Knutsen | Daewoo | May-10 | N.I.S. | DFDE | GTT | 4 | Various |
| Bebatic | 75,060 | Brunei Shell Tankers | Atlantique | Oct-72 | Brunei | S | GTT | 6 | Brunei LNG |
| Beidou Star | 172,000 | MOL | Hudong | Oct-15 | Hong Kong | DRL | GTT | 4 | Various |
| Berge Arzew | 138,088 | BW Gas | Daewoo | Jul-04 | Norway | S | GTT | 4 | Sonatrach |
| Bilbao Knutsen | 138,000 | Knutsen / Marpetrol | IZAR Sestao | Jan-04 | Spain | S | GTT | 4 | Atlantic LNG |
| Bilis | 77,730 | Brunei Shell Tankers | La Seyne | Mar-75 | Brunei | S | GTT | 5 | Brunei LNG |
| Bishu Maru | 162,000 | K Line-Transpacific | Kawasaki Sakaide | Dec-15 | Panama | S | Moss | 4 | Australia-Japan |
| Boris Davydov | 172,600 | Dynagas | Daewoo | Sept-18 | Cyprus | DFDE | GTT | 4 | Yamal LNG |
| Boris Vilkitsky | 172,600 | Dynagas | Daewoo | Jan-17 | Cyprus | DFDE | GTT | 4 | Yamal LNG |
| British Achiever | 173,644 | BP Shipping | Daewoo | June-18 | IOM | MEGI-DF | GTT | 4 | Various |
| British Contributor | 173,644 | BP Shipping | Daewoo | Oct-18 | IOM | MEGI-DF | GTT | 4 | Various |
| British Diamond | 155,000 | BP Shipping | Hyundai | Sep-08 | IOM | DFDE | GTT | 4 | Indonesia-Various |
| British Emerald | 155,000 | BP Shipping | Hyundai | Jun-07 | UK | DFDE | GTT | 4 | Tangguh LNG |
| British Innovator | 138,200 | BP Shipping | Samsung | Jul-03 | Isle of Man | S | GTT | 4 | Various |
| British Merchant | 138,000 | BP Shipping | Samsung | Apr-03 | Isle of Man | S | GTT | 4 | Various |
| British Partner | 173,644 | BP Shipping | Daewoo | Mar-18 | IOM | MEGI-DF | GTT | 4 | Various |
| British Ruby | 155,000 | BP Shipping | Hyundai | Jan-08 | U.K. | DFDE | GTT | 4 | Various |
| British Sapphire | 155,000 | BP Shipping | Hyundai | Sep-08 | IOM | DFDE | GTT | 4 | Tangguh |
| British Trader | 138,000 | BP Shipping | Samsung | Dec-02 | Isle of Man | S | GTT | 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 | GTT | 5 | Qatargas |
| BW GDF Suez Boston | 138,059 | BW Gas | Daewoo | Jan-03 | Norway | S | GTT | 4 | Suez LN |
| BW GDF Suez Everett | 138,028 | BW Gas | Daewoo | Jun-03 | Norway | S | GTT | 4 | Suez LNG |
| BW Integrity | 170,000 | BW Gas | Samsung | May-17 | Singapore | DFDE | GTT | 4 | FSRU |
| BW Lilac | 173,400 | BW Gas | Daewoo | Mar-18 | Malta | MEGI-DF | GTT | 4 | various |
| BW Pavilion Leeara | 161,880 | BW Gas | Hyundai | Feb-15 | Singapore | DFDE | GTT | 4 | Various |
| BW Pavilion Vanda | 161,880 | BW Gas | Hyundai | Feb-15 | Singapore | DFDE | GTT | 4 | Various |
| BW Singapore | 170,000 | BW Gas | Samsung | May-15 | Singapore | DFDE | GTT | 4 | FSRU |
| BW Suez Brussels | 162,400 | BW Gas | Daewoo | May-09 | N.I.S. | DFDE | GTT | 4 | Yemen-Atlantic |
| BW Suez Paris | 162,400 | BW Gas | Daewoo | May-09 | N.I.S. | DFDE | GTT | 4 | Yemen-Atlantic |
| BW Tulip | 173,400 | BW Gas | Daewoo | Jan-18 | Malta | MEGI-DF | GTT | 4 | various |
| Cadiz Knutsen | 138,826 | Knutsen / Marpetrol | IZAR Puerto Real | Jun-04 | Spain | S | GTT | 4 | Engas |
| Cape Ann | 145,000 | Hoegh LNG/MOL | Samsung | May-10 | Liberia | DFDE | GTT | 4 | Various |
| Castillo de Santisteban | 173,600 | Elcano | STX | Aug-10 | Malta | S | GTT | | Various |
| Castillo de Villalba | 138,000 | Elcano | IZAR | Nov-03 | Spain | S | GTT | 4 | Sonatrach |
| Catalunya Spirit | 138,000 | Teekay LNG Partners | IZAR Sestao | Mar-03 | Liberia | S | GTT | 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 | GTT | 4 | Australia-China |
| Cesi Gladstone | 174,100 | MOL-China LNG | Hudong | Oct-16 | Hong Kong | S | GTT | 4 | Australia-China |
| Cesi Lianyungang | 174,100 | MOL-China LNG | Hudong | June-18 | Hong Kong | S | GTT | 4 | Australia-China |
| Cesi Qingdao | 174,100 | MOL-China LNG | Hudong | Nov-16 | Hong Kong | S | GTT | 4 | Australia-China |
| Cesi Tianjin | 174,100 | MOL-China LNG | Hudong | Sept-17 | Hong Kong | S | GTT | 4 | Australia-China |
| Challenger FSRU | 263,000 | MOL LNG | Daewoo | Oct-17 | St Kitts | DFDE | GTT | 4 | Various |
| Cheikh Bouamama | 75,500 | Skikda LNG Transport | USC | Jul-08 | Bahamas | S | GTT | 4 | Sonatrach |
| Cheikh El Mokrani | 75,500 | Med LNG Corp | USC | Jun-07 | Bahamas | S | GTT | 4 | Sonatrach |
| Christophe de Margerie | 172,600 | SCF | Daewoo | Nov-16 | Cyprus | DFDE | GTT | 4 | Various |
| Clean Energy | 150,000 | Dynagas | Hyundai | Mar-07 | Marshall Is. | S | GTT | 4 | Various |
| Clean Force | 150,000 | Dynagas | Hyundai | Jan-08 | Marshall Is. | S | GTT | 4 | Various |
| Clean Ocean | 155,900 | Dynagas | Hyundai | Mar-14 | Marshall Is. | DFDE | GTT | 4 | Various |
| Clean Planet | 155,900 | Dynagas | Hyundai | Mar-14 | Marshall Is. | DFDE | GTT | 4 | Various |
| Clean Vision | 160,000 | Dynagas | Hyundai | Jun-15 | Marshall Is. | DFDE | GTT | 4 | Various |
| Cool Explorer | 160,000 | Thenamaris | Samsung | Oct-13 | Bermuda | DFDE | GTT | 4 | Various |
| Cool Runner | 160,000 | Thenamaris | Samsung | May-14 | Bermuda | DFDE | GTT | 4 | Various |
| Cool Voyager | 160,000 | Thenamaris | Samsung | Oct-13 | Bermuda | DFDE | GTT | 4 | Various |
| Corcovado LNG | 160,106 | TMSC Gas | Daewoo | Jun-14 | Malta | TFDE | GTT | 4 | Various |
| Creole Spirit | 174,000 | Teekay | Daewoo | Jan-16 | Bahamas | MEGI-DF | GTT | 4 | Cheniere |
| Cubal | 160,400 | Mitsui/NYK/Teekay | Samsung | Jan-12 | Bahamas | DFDE | GTT | 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 | GTT | 4 | Various |
| Dapeng Star | 147,000 | China Ships | Hudong | Nov-09 | China | S | GTT | 4 | Various |
| Dapeng Sun | 147,000 | China Ships | Hudong | Jul-07 | China | S | GTT | 4 | Woodside Energy |
| Diamond Gas Orchid | 165,000 | MOL-Jera | MHI-Nagasaki | Aug-18 | Japan | S-gas | Moss | 4 | US-Japan |
| Diamond Gas Rose | 165,000 | MOL-Jera | MHI-Nagasaki | Aug-18 | Japan | S-gas | Moss | 4 | US-Japan |
| Disha | 136,000 | Petronet LNG Ltd. | Daewoo | Jan-04 | Malta | S | GTT | 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 | GTT | 4 | Various |
| Dukhan | 135,000 | J4 Consortium | Mitsui Chiba | Oct-04 | Japan | S | Moss | 4 | Qatargas |
| Dwiputra | 127,385 | Humpuss Consortium | Mitsubishi Nagasaki | Mar-94 | Bahamas | S | Moss | 4 | Pertamina |
| Ebisu | 147,547 | Golar LNG | Kawasaki | Sep-08 | Bahamas | S | Moss | 4 | Various |
| Eduard Toll | 172,000 | Teekay-CLNG | Daewoo | Dec-17 | Bahamas | MEGI-DF | GTT | 4 | Various |
| Ejnan | 145,000 | 4J | Samsung | Jan-07 | Bahamas | S | GTT | | 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 | GTT | 4 | Various |

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| Energy Confidence | 155,000 | Tokyo LNG Tankers | Kawasaki | Apr-09 | Panama | S | Moss | 4 | Various |
| Energy Frontier | 147,600 | Tokyo LNG Tankers | Kawasaki Sakaide | Sep-03 | Japan | S | Moss | 4 | Darwin |
| Energy Glory | 165,000 | Tokyo LNG Tankers | JMU | Sept-18 | Japan | S | Moss | 4 | Various |
| Energy Horizon | 177,000 | Tokyo LNG Tankers | Kawasaki | Jul-11 | Japan | S | Moss | 4 | Pluto LNG |
| Energy Liberty | 165 000 | MOL | JMU Tsu | Oct-18 | Japan | TFDE | IHI-SPB | 4 | Various |
| Energy Navigator | 147,000 | Tokyo LNG Tankers | Kawasaki Sakaide | May-08 | Japan | S | Moss | 4 | Various |
| Energy Progress | 145,000 | MOL | Kawasaki | Nov-06 | Japan | S | Moss | 4 | Bayu Undan LNG |
| Enshu Maru | 165,257 | K Line | Kawasaki | June-18 | Japan | S | Moss | 4 | Various |
| Esshu Maru | 162,000 | K Line-Transpacific | Kawasaki Sakaide | Dec-14 | Panama | S | Moss | 4 | Australia-Japan |
| Excalibur | 138,200 | Exmar/ Excelerate | Daewoo | Oct-02 | Belgium | S | GTT | 4 | Various |
| Excel | 138,106 | Exmar/ MOL | Daewoo | Sep-03 | Belgium | S | GTT | 4 | Various |
| Excelerate | 138,000 | Exmar/Excelerate | Daewoo | Oct-06 | Belgium | S | GTT | 4 | Various |
| Excellence | 138,000 | GKFF Ltd. | Daewoo | May-05 | Belgium | S | GTT | 4 | Excelerate Energy |
| Excelsior | 138,000 | Exmar | Daewoo | Jan-05 | Belgium | S | GTT | 4 | Various |
| Exemplar | 150,900 | Excelerate | Daewoo | Jun-10 | Belgium | S | GTT | 4 | Various |
| Expedient | 151,000 | Excelerate | Daewoo | Nov-09 | Belgium | S | GTT | 4 | Various |
| Experience RV | 174,000 | Exmar/Excelerate | Daewoo | Jul-14 | Marshall Is. | DFDE | GTT | | Various |
| Explorer | 150,900 | Exmar/Excelerate | Daewoo | Mar-08 | Belgium | S | GTT | 4 | Excelerate |
| Express | 151,000 | Exmar/Excelerate | Daewoo | May-09 | Belgium | S | GTT | 4 | Various |
| Exquisite | 150,900 | Excelerate | Daewoo | Sep-09 | Belgium | S | GTT | 4 | Various |
| Fedor Litke | 172,636 | Dynagas | Daewoo | Nov-17 | Cyprus | DFDE | GTT | 4 | Various |
| Flex Endeavour | 173,400 | Flex LNG | Daewoo | Jan-18 | Marshall Is. | MEGI-DF | GTT | 4 | Various |
| Flex Enterprise | 173,400 | Flex LNG | Daewoo | Jan-18 | Marshall Is. | MEGI-DF | GTT | 4 | Various |
| Flex Rainbow | 174,000 | Flex LNG | Samsung | July-18 | Marshall Is. | MEGI-DF | GTT | 4 | Various |
| Flex Ranger | 174,000 | Flex LNG | Samsung | April-18 | Marshall Is. | MEGI-DF | GTT | 4 | Various |
| Fraiha | 210,100 | J5 Consortium | Daewoo | Sep-08 | Marshall Is. | DRL | GTT | 4 | Qatargas |
| FSRU Independence | 170,000 | Hoegh | Hyundai | Feb-14 | NIS | DFDE | GTT | 4 | Various |
| FSRU Lampung | 170,000 | Hoegh | Hyundai | May-14 | Indonesia | DFDE | GTT | 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 | GTT | 4 | RasGas II |
| Galea | 134,425 | Shell Shipping | Mitsubishi Nagasaki | Oct-02 | Singapore | S | Moss | 5 | Shell |
| Galicia Spirit | 140,620 | Teekay LNG Partners | Daewoo | Jul-04 | Liberia | S | GTT | 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 | GTT | 4 | Various |
| Gaslog Geneva | 174,000 | GasLog | Samsung | Sept-16 | Bermuda | TFDE | GTT | 4 | Shell charter |
| Gaslog Genoa | 174,000 | GasLog | Samsung | Jun-18 | Bermuda | TFDE | XDF | 4 | Various |
| Gaslog Gibraltar | 174,000 | GasLog | Samsung | Oct-16 | Bermuda | TFDE | GTT | 4 | Shell charter |
| Gaslog Glasgow | 174,000 | GasLog | Samsung | Jun-16 | Bermuda | TFDE | GTT | 4 | Shell charter |
| Gaslog Gladstone | 174,000 | GasLog | Samsung | May-19 | Bermuda | XDF | GTT | 4 | Various |
| Gaslog Greece | 174,000 | GasLog | Samsung | Mar-16 | Bermuda | TFDE | GTT | 4 | Shell charter |
| GasLog Hongkong | 174,000 | GasLog | Hyundai | Jun-18 | Bermuda | XDF | GTT | 4 | Various |
| GasLog Houston | 174,000 | GasLog | Hyundai | Jan-18 | Bermuda | XDF | GTT | 4 | Various |
| GasLog Salem | 165,000 | GasLog | Samsung | Apr-15 | Liberia | TFDE | GTT | 4 | Various |
| GasLog Santiago | 155,000 | GasLog | Samsung | Mar-13 | Liberia | TFDE | GTT | 4 | Various |
| GasLog Saratoga | 155,000 | GasLog | Samsung | Dec-14 | Bermuda | TFDE | GTT | 4 | Various |
| Gaslog Savannah | 155,000 | GasLog | Samsung | May-10 | Bermuda | DFDE | GTT | 4 | Various |
| GasLog Seattle | 155,000 | GasLog | Samsung | Oct-13 | Bermuda | TFDE | GTT | 4 | Various |
| GasLog Shanghai | 155,000 | GasLog | Samsung | Jan-13 | Liberia | TFDE | GTT | 4 | Various |
| Gaslog Singapore | 155,000 | GasLog | Samsung | Jul-10 | Bermuda | DFDE | GTT | 4 | Various |
| Gaslog Skagen | 155,000 | GasLog | Samsung | Oct-13 | Bermuda | DFDE | GTT | 4 | Various |
| Gaslog Sydney | 155,000 | GasLog | Samsung | May-13 | Bermuda | DFDE | GTT | 4 | Various |
| Gaslog Warsaw | 174,000 | GasLog | Samsung | May-19 | Bermuda | TFDE | GTT | 4 | Various |
| GDF-Suez Global Energy | 74,000 | Gaz de France | Chantiers | Dec-06 | France | DFDE | CS1 | 4 | Sonatrach |
| GDF-Suez Point Fortin | 154,200 | LNG Japan | Imabari/Koyo | Feb-10 | Panama | DFDE | GTT | 4 | Various |
| Gemmata | 138,100 | Shell Shipping | Mitsubishi Nagasaki | Mar-04 | Singapore | S | Moss | 5 | Shell |
| Georgiy Brusilov | 172,000 | Dynagas | Daewoo | Jun-18 | Cyprus | DFDE | GTT | 4 | Yamal LNG |
| Ghasha | 137,510 | National Gas Shipping | Mitsui | Jun-95 | Liberia | S | Moss | 5 | ADGAS |
| Gigira Laitebo | 177,000 | MOL-Itochu | Hyundai | Feb-09 | Panama | DFDE | GTT | 4 | Various |
| Golar Arctic | 140,645 | Golar LNG | Daewoo | Dec-03 | Marshall Is. | S | GTT | 4 | Shell Spot |
| Golar Bear | 160,000 | Golar | Samsung | Mar-14 | Bermuda | TFDE | GTT | 4 | Various |
| Golar Celsius | 160,000 | Golar LNG | Samsung | Sep-13 | Bermuda | DFDE | GTT | 4 | Various |
| Golar Crystal | 160,000 | Golar LNG | Samsung | Oct-13 | Bermuda | TFDE | GTT | 4 | Various |
| Golar Eskimo (FSRU) | 160,000 | Golar LNG | Samsung | Jan-15 | Bermuda | DFDE | GTT | 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. | TFDE | GTT | 4 | Various |
| Golar Grand | 145,880 | Golar LNG | Daewoo | 2006 | IoM | S | GTT | 4 | Various |
| Golar Ice | 160,000 | Golar LNG | Samsung | Feb-15 | Bermuda | DFDE | GTT | 4 | Various |
| Golar Igloo (FSRU) | 160,000 | Golar LNG | Samsung | Oct-13 | Bermuda | DFDE | GTT | 4 | Various |
| Golar Kelvin | 160,000 | Golar LNG | Samsung | Jan-15 | Bermuda | DFDE | GTT | 4 | Various |
| Golar Maria | 145,950 | Golar LNG | Daewoo | 2006 | Marshall Is. | S | GTT | 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. | TFDE | GTT | 4 | Various |
| Golar Seal | 160,000 | Golar LNG | Samsung | Aug-13 | Bermuda | TFDE | GTT | 4 | Various |
| Golar Singapore (FSRU) | 160,000 | Golar LNG | Samsung | June-15 | Bermuda | TFDE | GTT | 4 | Various |

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| Golar Snow | 160,000 | Golar LNG | Samsung | Jan-15 | Bermuda | TFDE | GTT | 4 | Various |
| Golar Tundra (FSRU) | 160,000 | Golar LNG | Samsung | Dec-15 | Bermuda | TFDE | GTT | 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 | GTT | 4 | Petrobras |
| Grace Acacia | 150,000 | Algaet Shipping | Hyundai | Jan-07 | Japan | S | GTT | 4 | Various |
| Grace Barleria | 150,000 | Swallowtail Ship | Hyundai | Oct-07 | Japan | S | GTT | 4 | Various |
| Grace Cosmos | 150,000 | AGH Shipping | Hyundai | Mar-08 | Japan | S | GTT | 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 | GTT | 4 | Shell BG |
| Granatina | 140,645 | Shell Shipping | Daewoo | Dec-03 | Singapore | S | GTT | 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 | GTT | 4 | Oman Gas |
| Hanjin Pyeong Taek | 130,600 | Hanjin Shipping | Hanjin | Sep-95 | Panama | S | GTT | 4 | Pertamina |
| Hanjin Ras Laffan | 138,214 | Hanjin Shipping | Hanjin | Jul-00 | Panama | S | GTT | 4 | QatarGas |
| Hanjin Sur | 138,333 | Hanjin Shipping | Hanjin | Jan-00 | Panama | S | GTT | 4 | Oman Gas |
| Hispania Spirit | 140,500 | Teekay LNG Partners | Daewoo | Sep-02 | Spain | S | GTT | 4 | Atlantic LNG |
| Hoegh Esperanza FSRU | 170,000 | Hoegh | Hyundai | April-18 | Norway | DFDE | GTT | 4 | Various |
| Hoegh Gallant FSRU | 170,050 | Hoegh LNG | Hyundai | May-14 | Marshall Is. | DFDE | GTT | 4 | chartered |
| Hoegh Giant FSRU | 170,050 | Hoegh LNG | Hyundai | Jan-18 | Marshall Is. | DFDE | GTT | 4 | various |
| Hoegh Grace FSRU | 170,050 | Hoegh LNG | Hyundai | May-15 | Marshall Is. | DFDE | GTT | 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 | GTT | 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 | GTT | 4 | Oman LNG |
| Ibri LNG | 145,000 | Oman Gas | Mitsubishi | Jul-06 | Panama | S | GTT | 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 | GTT | 4 | Oman Gas |
| K Freesia | 135,256 | Korea Line | Daewoo | Jun-00 | Panama | S | GTT | 4 | RasGas |
| Kinisis | 173,400 | K-Line | Daewoo | Jan-18 | Liberia | MEGI-DF | GTT | 4 | Various |
| K Jasmine | 145,700 | Korea Line | Daewoo | Mar-08 | Panama | S | GTT | 4 | Kogas offtake |
| K Mugungwha | 152,000 | K Line | Daewoo | Nov-08 | Panama | S | GTT | 4 | Various |
| Kita LNG | 160,106 | TMSC Gas | Daewoo | Jun-14 | Malta | TFDE | GTT | 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 | GTT | 4 | PNG-Asia |
| Lalla Fatma N'Soumer | 145,000 | Algeria Nippon Gas | Kawasaki Sakaide | Dec-04 | Bahamas | S | Moss | 4 | Various |
| Lijmilya | 261,700 | QGTC | Daewoo | Sep-08 | Marshall Is. | DRL | GTT | 5 | Various |
| LNG Abalamabie | 174,900 | Bonny Gas | Samsung | Nov-16 | Bermuda | DFDE | GTT | 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 | GTT | 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 | GTT | 4 | Nigeria LNG |
| LNG Bonny | 177,000 | Bonny Gas Transport | Hyundai | Oct-15 | Bermuda | DFDE | GTT | 4 | Nigeria LNG |
| LNG Borno | 149,600 | NYK Line | Samsung | Aug-07 | Japan | S | GTT | 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 Dubhe | 174,000 | MOL-Cosco | Hudong | Sept-19 | China | S | GTT | 4 | Russia-Asia |
| 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 | GTT | 4 | Nigeria LNG |
| LNG Fimina | 175,000 | Bonny Gas Transport | Samsung | Oct-15 | Bermuda | DFDE | GTT | 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 | GTT | 4 | Nigeria LNG |
| LNG Jamal | 135,330 | Osaka Gas/J3 Consortium | Mitsubishi Nagasaki | Oct-00 | Japan | S | Moss | 5 | Oman Gas |
| LNG Juno | 177,300 | MOL-Osaka | Mitsubishi | Oct-18 | Marshall Is. | DFDE | Moss | 4 | Freeport LNG/Various |
| LNG Jupiter | 145,000 | NYK Line | Kawasaki | Jul-09 | Bahamas | S | Moss | 4 | Various |
| LNG Jurojin | 155,300 | MOL | MHI Nagasaki | Nov-15 | Japan | S | KM | 4 | Various |
| LNG Kano | 148,471 | BW Gas | Daewoo | Jan-07 | Bermuda | S | GTT | 4 | NLNG |
| LNG Lagos | 177,000 | Bonny Gas | Hyundai | Oct-15 | Bermuda | DFDE | GTT | 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 | GTT | 4 | Sonatrach |
| LNG Libra | 126,400 | Hoegh LNG | GD Quincy | Apr-79 | Marshall Is. | S | Moss | 5 | Various |

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| LNG Lokoja | 148,300 | BW Gas | Daewoo | Dec-06 | Bermuda | S | GTT | 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 | GTT | 4 | Nigeria LNG |
| LNG Ondo | 148,300 | BW Gas | Daewoo | Sep-07 | Bermuda | S | GTT | 4 | Nigeria LNG |
| LNG Oyo | 140,500 | BW Gas | Daewoo | Dec-05 | Bermuda | S | GTT | 4 | Nigeria LNG |
| LNG Pioneer | 138,000 | MOL | Daewoo | Jul-05 | Bahamas | S | GTT | 4 | Idku |
| LNG Port Harcourt | 175,000 | Bonny Gas | Samsung | Oct-15 | Bermuda | DFDE | GTT | 4 | Nigeria LNG |
| LNG Portovenere | 65,000 | Exmar | Italcantieri Sestri | Jun-96 | Italy | S | GTT | 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 | GTT | 4 | Nigeria LNG |
| LNG Rivers | 137,231 | Bonny Gas Transport | Hyundai | Jun-02 | Bermuda | S | Moss | 4 | Nigeria LNG |
| LNG Sakura | 177,000 | NYK-Kepco | Kawasaki | Mar-18 | Bahamas | DFDE | GTT | 4 | Various |
| LNG Saturn | 153,000 | MOL | MHI | Nov-15 | Japan | S | Moss | 4 | Various |
| LNG Schneeweisschen | 180,000 | MOL-Itochu | Daewoo | Aug-18 | Panama | XDF | GTT | 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 | GTT | 4 | Various |
| Lusail | 138,000 | Peninsular LNG | Samsung | May-05 | Bahamas | S | GTT | 4 | Qatar |
| Macoma | 173,400 | Teekay | Daewoo | Oct-17 | Bahamas | DFDE | GTT | 4 | Various |
| Madrid Spirit | 138,000 | Teekay LNG Partners | IZAR Puerto Real | Jan-05 | Spain | S | GTT | 4 | Engas |
| Magdala | 173,400 | Teekay | Daewoo | Feb-18 | Bahamas | DFDE | GTT | 4 | Various |
| Magellan Spirit | 165,500 | Teekay LNG Partners | Samsung | Sep-08 | Denmark | DFDE | GTT | 4 | Various |
| Malanje | 160,400 | Mitsui/NYK/Teekay | Samsung | Jul-11 | Bahamas | DFDE | GTT | 4 | Various |
| Maran Gas Achilles | 174,000 | Maran | Hyundai Samho | Feb-16 | Greece | DFDE | GTT | 4 | Various |
| Maran Gas Agamemnon | 174,000 | Maran | Hyundai Samho | May-16 | Greece | DFDE | GTT | 4 | Various |
| Maran Gas Alexandria | 161,870 | Maran | Hyundai Samho | Sep-15 | Greece | DFDE | GTT | 4 | Various |
| Maran Gas Amphipolis | 173,400 | Maran | Daewoo | Aug-16 | Greece | DFDE | GTT | 4 | Various |
| Maran Gas Apollonia | 161,870 | Maran | Daewoo | Jan-14 | Greece | DFDE | GTT | 4 | Various |
| Maran Gas Asclepius | 145,000 | Kristen Navigation | Daewoo | Jul-05 | Bermuda | S | GTT | 4 | Qatar |
| Maran Gas Coronis | 145,700 | Maran | Daewoo | Sep-07 | Greece | S | GTT | 4 | Rasgas II |
| Maran Gas Delphi | 159,800 | Maran | Daewoo | Feb-14 | Greece | DFDE | GTT | 4 | Various |
| Maran Gas Efessos | 159,800 | Maran | Daewoo | Jun-14 | Greece | DFDE | GTT | 4 | Various |
| Maran Gas Hector | 174,000 | Maran | Hyundai Samho | Nov-16 | Greece | DFDE | GTT | 4 | Various |
| Maran Gas Lindos | 159,800 | Maran | Daewoo | Jun-15 | Greece | DFDE | GTT | 4 | Various |
| Maran Gas Mystras | 155,900 | Maran Gas | Daewoo | May-15 | Greece | DFDE | GTT | 4 | Various |
| Maran Gas Olympias | 174,500 | Maran | DSME | Feb-17 | Greece | DFDE | GTT | 4 | Various |
| Maran Gas Pericles | 174,000 | Maran | Hyundai Samho | June-16 | Greece | DFDE | GTT | 4 | Various |
| Maran Gas Posidonia | 161,870 | Maran | Daewoo | May-14 | Greece | DFDE | GTT | 4 | Various |
| Maran Gas Roxana | 173,400 | Maran | Daewoo | Jan-17 | Greece | DFDE | GTT | 4 | Various |
| Maran Gas Sparta | 161,870 | Maran | Hyundai Samho | April-15 | Greece | DFDE | GTT | 4 | Various |
| Maran Gas Spetses | 174,000 | Maran | Daewoo | Feb-18 | Greece | DFDE | GTT | 4 | Various |
| Maran Gas Troy | 155,900 | Maran Gas | Daewoo | May-15 | Greece | DFDE | GTT | 4 | various |
| Maran Gas Ulysses | 174,000 | Maran | Hyundai Samho | Jan-17 | Greece | DFDE | GTT | 4 | Various |
| Maria Energy | 174,000 | Tsakos | Hyundai | Mar-15 | Marshall Is. | TFDE | GTT | 4 | Various |
| Marib Spirit | 165,000 | Teekay LNG | Samsung | May-08 | Marshall Is. | DFDE | GTT | 4 | Various |
| Marvel Crane | 177,000 | NYK-Mitsui | Mitsubishi | Mar-19 | Singapore | S | Moss | 4 | US/Various |
| Marvel Eagle | 155,000 | MOL-Osaka | Kawasaki | Sept-18 | Marshall Is. | S | Moss | 4 | Cameron LNG/Various |
| Marvel Falcon | 174,000 | NYK-Mitsui | Samsung | Dec-18 | Singapore | XDF | GTT | 4 | Cameron LNG/Various |
| Marvel Hawk | 174,000 | NYK-Mitsui | Samsung | Dec-18 | Singapore | XDF | GTT | 4 | Cameron LNG/Various |
| Marvel Kite | 174,000 | NYK-Mitsui | Samsung | Dec-18 | Singapore | XDF | GTT | 4 | Various |
| Matthew | 126,540 | Suez LNG Shiping | Newport News | Jun-79 | Bahamas | S | GTT | 6 | Atlantic LNG |
| Megara | 173,000 | Teekay | Daewoo | Oct-18 | Bahama | MEGI-DF | GTT | 4 | Various |
| Mekaines | 266,000 | Naklilat | Samsung | Mar-09 | Liberia | DRL | GTT | 4 | Qatar-Atlantic Basin |
| Meridian Spirit | 165,500 | Teekay LNG | Samsung | Jan-10 | Denmark | DFDE | GTT | 4 | Various |
| Mesaimeer | 210,100 | Naklilat | Hyundai | Mar-09 | Liberia | DRL | GTT | 4 | Qatar-Atlantic Basin |
| Methane Alison Victoria | 145,000 | GasLog | Samsung | Aug-07 | Bermuda | S | GTT | 4 | Eq.Guinea LNG |
| Methane Becki Anne | 170,000 | GasLog | Samsung | Sep-10 | Bermuda | TFDE | GTT | 4 | Various |
| Methane Heather Sally | 145,000 | GasLog | Samsung | Jul-07 | Bermuda | S | GTT | 4 | Eq.Guinea LNG |
| Methane Jane Elizabeth | 145,000 | GasLog | Samsung | Jun-06 | Bermuda | TFDE | GTT | 4 | Engas |
| Methane Julia Louise | 170,000 | GasLog | Samsung | Dec-09 | Bermuda | TFDE | GTT | 4 | Various |
| Methane Kari Elin | 138,200 | Shell | Samsung | Jun-04 | Bermuda | S | GTT | 4 | Various |
| Methane Lake Charles | 145,000 | Shell | Samsung | Feb-07 | Bermuda | S | GTT | 4 | Marathon Oil |
| Methane Lydon Volney | 145,000 | Shell | Samsung | Aug-06 | Bermuda | S | GTT | 4 | Engas |
| Methane Mickie Harper | 170,000 | Shell-GasLog | Samsung | Nov-10 | Bermuda | TFDE | GTT | 4 | Various |
| Methane Nile Eagle | 145,000 | Shell-GasLog | Samsung | Dec-07 | Bermuda | S | GTT | 4 | Engas |
| Methane Patricia Camila | 170,000 | Shell-GasLog | Samsung | Oct-10 | Bermuda | TFDE | GTT | 4 | Various |
| Methane Princess | 138,159 | Golar LNG | Daewoo | 2003 | UK | S | GTT | 4 | Spot BG |
| Methane Rita Andre | 145,000 | GasLog | Samsung | Mar-06 | Bermuda | S | GTT | 4 | Engas |
| Methane Shirley Elizabeth | 145,000 | GasLog | Samsung | Apr-07 | Bermuda | S | GTT | 4 | Marathon Oil |
| Methane Sprit | 165,000 | Teekay LNG | Samsung | Mar-08 | Singapore | DFDE | GTT | 4 | Various |
| Milaha Qatar | 145,000 | Milaha | Samsung | Apr-06 | Denmark | S | GTT | 4 | Qatar |
| Milaha Ras Laffan | 138,270 | Milaha | Samsung | Mar-04 | Denmark | S | GTT | 4 | RasGas II |

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| Min Lu | 147,000 | China Ships | Hudong | Aug-09 | China | S | GTT | 4 | Various |
| Min Rong | 147,000 | China LNG Ships | Hudong | Feb-09 | Hong Kong | S | GTT | 4 | Australia-China |
| Mourad Didouche | 126,130 | Hyproc Shipping | Atlantique | Jul-80 | Algeria | S | GTT | 5 | Sonatrach |
| Mozah | 266,000 | QGTC | Samsung | Aug-08 | Qatar | DRL | GTT | 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 | GTT | 4 | Qatar-Atlantic Basin |
| Murex | 173,400 | Teekay | Daewoo | Oct-17 | Bahamas | DFDE | GTT | 4 | Various |
| Murwab | 210,100 | J5 Consortium | Daewoo | May-08 | Marshall Is. | DRL | GTT | 4 | Qatargas |
| Muscat LNG | 149,170 | Oman Gas/MOL | Kawasaki Sakaide | Mar-04 | Japan | S | Moss | 4 | Oman Gas |
| Myrina | 173,000 | Teekay | Daewoo | Sept-18 | Bahamas | MEGI-DF | GTT | 4 | Various |
| Neo Energy | 149,700 | Tsakos | Hyundai | Feb-07 | Liberia | S | GTT | 4 | Various |
| Neptune | 145,000 | Hoegh LNG/MOL | Samsung | Dec-09 | Liberia | DFDE | GTT | 4 | Various |
| Nikolay Yevgenov | 172,600 | Teekay | Daewoo | Oct-18 | Bahamas | MEGI-DF | GTT | 4 | Various |
| Nikolay Zubkov | 172,600 | Dynagas | Daewoo | Nov-18 | Cyprus | DFDE | GTT | 4 | Yamal LNG |
| 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 | GTT | 4 | NWS |
| Northwest Swift | 127,590 | J3 Consortium | Mitsubishi Nagasaki | Sep-89 | Japan | S | Moss | 4 | NWS |
| Noshu Maru | 180,000 | MOL-Jera | MHI-Nagasaki | Feb-19 | Japan | S-gas | Moss | 4 | US-Japan |
| Oak Spirit | 173,400 | Teekay | Daewoo | Jan-16 | Bahamas | MEGI-DF | GTT | 4 | Cheniere |
| Ob River | 150,000 | Lance Shipping | Hyundai | Oct-07 | Marshall Is. | S | GTT | 4 | Various |
| Oceanic Breeze | 155,300 | K-Line | Mitsubishi-Nagasaki | June-18 | Japan | S | Moss | 4 | Darwin-Japan |
| Onaiza | 210,100 | Nakilat | Daewoo | Apr-09 | Liberia | DRL | GTT | 4 | Qatar-Atlantic Basin |
| Ougarta | 171,866 | Hyproc Shipping | Hyundai | Mar-17 | Algeria | DFDE | GTT | 4 | Sonatrach |
| Pacific Arcadia | 147,200 | NYK Line | MHI | Oct-14 | Bahamas | S | KM | 4 | Various |
| Pacific Breeze | 182,000 | K Line | Kawasaki | Mar-18 | Marshall Is. | DFDE | Moss | 4 | Ichthys LNG |
| Pacific Enlighten | 145,000 | LNG MT | Mitsubishi | Mar-09 | Japan | S | Moss | 4 | Various |
| Pacific 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 | GTT | 4 | Various |
| Pan Americas | 174,000 | Teekay | Hudong | Mar-18 | Hong Kong | TFDE | GTT | 4 | US-Asia |
| Pan Asia | 174,000 | Teekay | Hudong-Zhonghua | July-17 | Bahamas | TFDE | GTT | 4 | Cheniere |
| Pan Europe | 174,000 | Teekay | Hudong | Sept-18 | Hong Kong | TFDE | GTT | 4 | US-global |
| Papua | 171,800 | MOL-China | Hudong | Jan-15 | Hong Kong | DFDE | SSD | 4 | PNG LNG |
| Patris | 173,400 | K-Line | Daewoo | Feb-18 | Liberia | MEGI-DF | GTT | 4 | Various |
| Polar Eagle | 89,880 | Polar LNG | IHI Chita | Jun-93 | Liberia | S | IHI SPB | 4 | ConocoPhillips/Marathon |
| Prachi | 173,000 | NYK-SCI | Hyundai | Nov-16 | Singapore | TFDE | GTT | 4 | Petronet |
| Provalys | 153,500 | Gaz de France | Chantiers | Nov-06 | France | DFDE | CS1 | 4 | ELNG |
| Pskov | 170,200 | SovComFlot | STX | Mar-14 | Liberia | DFDE | GTT | 4 | Various |
| Puteri Delima | 130,400 | MISC | Atlantique | Jan-95 | Malaysia | S | GTT | 4 | Petronas |
| Puteri Delima Satu | 137,100 | MISC | Mitsui Chiba | Apr-02 | Malaysia | S | GTT | 4 | Petronas |
| Puteri Firuz | 130,400 | MISC | Atlantique | May-97 | Malaysia | S | GTT | 4 | Petronas |
| Puteri Firuz Satu | 137,100 | MISC | Mitsubishi Nagasaki | Sep-04 | Malaysia | S | GTT | 4 | Petronas |
| Puteri Intan | 130,400 | MISC | Atlantique | Aug-94 | Malaysia | S | GTT | 4 | Petronas |
| Puteri Intan Satu | 137,100 | MISC | Mitsubishi Nagasaki | Dec-01 | Malaysia | S | GTT | 4 | Petronas |
| Puteri Mutiera Satu | 137,100 | MISC | Mitsui Chiba | Apr-05 | Malaysia | S | GTT | 4 | Petronas |
| Puteri Nilam | 130,400 | MISC | Atlantique | Jun-95 | Malaysia | S | GTT | 4 | Petronas |
| Puteri Nilam Satu | 137,100 | MISC | Mitsubishi Nagasaki | Sep-03 | Malaysia | S | GTT | 4 | Petronas |
| Puteri Zamrud | 130,400 | MISC | Atlantique | May-96 | Malaysia | S | GTT | 4 | Petronas |
| Puteri Zamrud Satu | 137,100 | MISC | Mitsui Chiba | Apr-87 | Malaysia | S | GTT | 4 | Atlantic LNG |
| Raahi | 136,000 | Petronet LNG Ltd | Daewoo | Dec-04 | Malta | S | GTT | 4 | Qatargas |
| Ramdane Abane | 126,130 | Hyproc Shipping | Atlantique | Jul-81 | Algeria | S | GTT | 5 | Sonatrach |
| Rasheeda | 266,000 | QGTC | Samsung | Jun-10 | Liberia | DRL | GTT | | Various |
| Rias Baixas Knutsen | 180,000 | Knutsen | Hyundai | Aug-19 | Spain | MEGI-DF | GTT | 4 | Various |
| Ribera del Duero Knutsen | 173,400 | Knutsen | Daewoo | Nov-10 | Nor-NIS | DFDE | GTT | 4 | Various |
| Rioja Knutsen | 176,300 | Knutsen | Daewoo | Dec-16 | Nor-NIS | DFDE | GTT | 4 | Various |
| Rudolf Samoylovich | 172,652 | Teekay-CLNG | Daewoo | Oct-18 | Bahamas | MEGI-DF | GTT | 4 | Various |
| Salalah LNG | 147,000 | Oman Gas/MOL | Samsung | Dec-05 | Japan | S | GTT | 4 | Oman |
| SCF Polar | 71,500 | Sovcomflot | Kockums | Aug-69 | Liberia | S | GTT | 6 | Sonatrach |
| Sean Spirit | 174,000 | Teekay | Hyundai Samho | Feb-19 | Bahama | MEGI-DF | GTT | 4 | Various |
| Seishu Maru | 162,000 | K Line-Transpacific | Kawasaki Sakaide | Jan-15 | Panama | S | Moss | 4 | Australia-Japan |
| Seri Alam | 138,000 | MISC | Samsung | Oct-05 | Malaysia | S | GTT | 4 | Yemen LNG |
| Seri Amanah | 145,000 | MISC | Samsung | Mar-06 | Malaysia | S | GTT | 4 | Yemen LNG |
| Seri Anggun | 145,000 | MISC | Samsung | Nov-06 | Malaysia | S | GTT | 4 | Yemen LNG |
| Seri Angkasa | 145,000 | MISC | Samsung | Feb-07 | Malaysia | S | GTT | 4 | Petronas |
| Seri Ayu | 145,000 | MISC | Samsung | Oct-07 | Malaysia | S | GTT | 4 | Various |
| Seri Bakti | 152,300 | MISC | Mitsubishi | Mar-07 | Malaysia | S | GTT | 4 | Petronas |

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| Seri Balhaf | 152,000 | MISC | Mitsubishi | Sep-08 | Malaysia | S | GTT | 4 | Various |
| Seri Balquis | 152,000 | MISC | Mitsubishi | Dec-08 | Malaysia | S | GTT | 4 | Various |
| Seri Begawan | 152,300 | MISC | Mitsubishi | Dec-07 | Malaysia | S | GTT | 4 | Various |
| Seri Bijaksana | 152,300 | MISC | Mitsubishi | Feb-08 | Malaysia | S | GTT | 4 | Petronas |
| Seri Camar | 150,200 | MISC | Hyundai | Feb-18 | Malaysia | S | Moss | 4 | Petronas |
| Seri Camellia | 150,000 | MISC | Hyundai | Nov-16 | Malaysia | S | Moss | 4 | Petronas |
| Seri Cemara | 150,200 | MISC | Hyundai | Apr-18 | Malaysia | S | Moss | 4 | Petronas |
| Seri Cempak | 150,200 | MISC | Hyundai | Feb-18 | Malaysia | S | Moss | 4 | Petronas |
| Seri Cenderawasih | 150,000 | MISC | Hyundai | Jan-17 | Malaysia | S | Moss | 4 | Petronas |
| Sestao Knutsen | 138,000 | Knutsen | IZAR Sestao | Jan-07 | Spain | S | GTT | 4 | Atlantic LNG |
| Sevilla Knutsen | 173,400 | Knutsen | Daewoo | Jun-10 | N.I.S. | DFDE | GTT | 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 | GTT | 5 | Qatargas IV |
| Shen Hai | 147,100 | China LNG | Hudong Zhonghua | Sep-12 | China | AB/CC Steam | GTT | 4 | Various |
| Simaisma | 147,700 | Maran Gas Maritime | Daewoo | Jul-06 | Greece | S | GTT | 4 | Qatar |
| SK Audace | 180,000 | SK-Marubeni | Samsung | Jul-17 | Panama | XDF | GTT | 4 | Various |
| SK Resolute | 180,000 | SK-Marubeni | Samsung | Jun-18 | Panama | XDF | GTT | 4 | Various |
| SK Splendor | 138,375 | SK Shipping | Samsung | Mar-00 | Panama | S | GTT | 4 | Oman Gas |
| SK Stellar | 138,375 | SK Shipping | Samsung | Dec-00 | Panama | S | GTT | 4 | RasGas |
| SK Summit | 138,000 | SK Shipping | Daewoo | Aug-99 | Panama | S | GTT | 4 | RasGas |
| SK Sunrise | 138,306 | I. S. Carriers | Samsung | Sep-03 | Panama | S | GTT | 4 | RasGas |
| SK Supreme | 138,200 | SK Shipping | Samsung | Jan-00 | Panama | S | GTT | 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 | GTT | 4 | Various |
| Sonangol Benguela | 160,500 | Sonangol | Daewoo | Sep-11 | Bahamas | S | GTT | 4 | Angola LNG |
| Sonangol Etosha | 160,500 | Sonangol | Daewoo | Sep-11 | Bahamas | S | GTT | 4 | Angola LNG |
| Sonangol Sambizanga | 160,500 | Sonangol | Daewoo | Sep-11 | Bahamas | S | GTT | 4 | Angola LNG |
| Southern Cross | 172,000 | MOL | Hudong | May-15 | Hong Kong | DRL | GTT | 4 | Various |
| Soyo | 160,400 | Mitsui/NYK/Teekay | Samsung | May-11 | Bahamas | DFDE | GTT | 4 | Various |
| Spirit of Hela | 177,000 | MOL | Hyundai | Oct-09 | Panama | DFDE | GTT | 4 | Various |
| Stena Blue Sky | 145,700 | Stena | Daewoo | Jan-06 | Panama | S | GTT | 4 | Various |
| Stena Clear Sky | 171,800 | Stena | Daewoo | Sep-10 | Panama | DFDE | GTT | 4 | Various |
| Stena Crystal Sky | 171,800 | Stena | Daewoo | Jul-10 | Panama | DFDE | GTT | 4 | Various |
| STX Kolt | 145,700 | STX Panocean | Korea Hanjin | Nov-08 | Panama | DFDE | GTT | 4 | Various |
| Suez Point Fortin | 154,200 | Trinity LNG | Koyo Japan | Nov-09 | Panama | S | GTT | 4 | Yemen LNG |
| Symphonic Breeze | 147,608 | K-Line | Mitsubishi Nagasaki | Oct-07 | Bahamas | DFDE | Moss | 4 | Australia-Japan |
| 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 | GTT | | Tangguh |
| Tangguh Foja | 155,000 | K Line | Samsung | Jul-08 | Panama | DFDE | GTT | 4 | Tangguh LNG |
| Tangguh Hiri | 155,000 | Teekay LNG | Hyundai | Nov-08 | IOM | DFDE | GTT | 4 | Tangguh |
| Tangguh Jaya | 145,700 | K Line | Samsung | Nov-08 | Panama | DFDE | GTT | 4 | Tangguh |
| Tangguh Palung | 155,000 | K Line | Samsung | Mar-09 | Panama | DFDE | GTT | 4 | Tangguh |
| Tangguh Sago | 155,000 | Teekay LNG | Hyundai | Mar-09 | IOM | DFDE | GTT | 4 | Tangguh LNG |
| Tangguh Towuti | 145,700 | Sovcomflot/NYK | Daewoo | Oct-08 | Cyprus | S | GTT | 4 | Tangguh |
| Tembek | 216,200 | OSG/Nakilat | Samsung | Sep-07 | Marshall Is. | DRL | GTT | 4 | Qatargas II |
| Tenaga Satu | 130,000 | MISC | Dunkerque | Sep-82 | Malaysia | S | GTT | 5 | Petronas |
| Tessala | 171,866 | Hyproc Shipping | Hyundai | Dec-16 | Algeria | DFDE | GTT | 4 | Sonatrach |
| Torben Spirit | 173,000 | Teekay | Daewoo | Feb-17 | Bahama | MEGI-DF | GTT | 4 | Various |
| Trinity Arrow | 154,900 | K Line | Imabari Shipbuilding | Mar-08 | Panama | S | GTT | 4 | Various |
| Umm Al Amad | 210,100 | J5 | Daewoo | Aug-08 | Marshall Is. | DRL | GTT | 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 | GTT | 4 | Qatargas |
| Umm Slaal | 266,000 | QGTC | Samsung | Nov-08 | Qatar | DRL | GTT | 5 | Qatargas |
| Valencia Knutsen | 173,400 | Knutsen | Daewoo | Sep-10 | Nor-NIS | DFDE | GTT | 4 | Various |
| Velikiy Novgorod | 170,200 | SovComFlot | STX | Feb-14 | Liberia | DFDE | GTT | 4 | Various |
| Vladimir Rusanov | 172,000 | MOL-China Shipping | Daewoo | Mar-18 | Hong Kong | DFDE | GTT | 4 | Yamal |
| Vladimir Viz | 172,000 | MOL-China Shipping | Daewoo | Sept-18 | Hong Kong | DFDE | GTT | 4 | Yamal |
| Vladimir Voronin | 172,600 | Teekay | Daewoo | Jun-19 | Bahamas | MEGI-DF | GTT | 4 | Various |
| Wakaba Maru | 125,000 | J3 Consortium | Mitsui Chiba | Apr-85 | Japan | S | Moss | 5 | Pertamina |
| WilForce | 156,000 | Teekay LNG | Daewoo | Aug-13 | NIS | DFDE | GTT | 4 | Various |
| WilPride | 156,000 | Teekay | Daewoo | June-13 | NIS | DFDE | GTT | 4 | Various |
| Woodside Cheney | 174,000 | Maran | Hyundai Samho | Mar-16 | Greece | DFDE | GTT | 4 | Various |
| Woodside Donaldson | 165,500 | Teekay LNG | Samsung | Dec-09 | Singapore | DFDE | GTT | 4 | Various |
| Woodside Goode | 159,800 | Maran | Daewoo | Jul-14 | Greece | DFDE | GTT | 4 | Various |
| Woodside Reeswithers | 173,400 | Maran | Daewoo | Nov-16 | Greece | DFDE | GTT | 4 | Various |
| Woodside Rogers | 155,900 | Maran Gas | DSME | Jul-13 | Greece | DFDE | GTT | 4 | Various |
| Yamal Spirit | 174,000 | Teekay | Hyundai Samho | Jan-19 | Bahama | MEGI-DF | GTT | 4 | Various |
| Yari LNG | 159,983 | TMSC Gas | Daewoo | Jun-14 | Malta | TFDE | GTT | 4 | Various |
| Yenisei River | 155,000 | Dynagas | Hyundai | Jul-13 | Marshall Is. | DFDE | GTT | 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 | GTT | 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*

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# LNG Import Terminals

## Explanatory Notes

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

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

| Country | Location (Project) | Owners | Start up | Storage Tanks | Storage Capacity |
|---|---|---|---|---|---|
| Belgium | Zeebrugge | Fluxys | 1987 | 4 | 380,000 |
| Canada | Canaport Saint John | Irving Oil, Repsol | 2009 | 3 | 480,000 |
| Chile | Quintero | ENAP, Metrogas, Enagas | 2009 | 3 | 334,000 |
| | Mejillones | Engie, Ameris Capital AGF | 2010 | 1 | 175,000 |
| China | Beihai LNG, Guangxi | Sinopec | 2015 | 4 | 640,000 |
| | Dalian | PetroChina | 2011 | 3 | 480,000 |
| | Dapeng ND Guangdong | CNOOC | 2018 | 4 | 640,000 |
| | Dongguan, Guangdong | Jovo Group | 2013 | 2 | 160 000 |
| | Fujian LNG (Xiuyu) | CNOOC, Fujian I&D Corp. | 2008 | 2 | 640,000 |
| | Guangdong | CNOOC,BP | 2006 | 3 | 480,000 |
| | Haikou, Hainan LNG | CNOOC | 2014 | 3 | 480,000 |
| | Ningbo, Zheijang | CNOOC, Zhejiang Energy | 2012 | 3 | 480,000 |
| | Qidong, Jiangsu | Guanghui Energy | 2018 | 1 | 60,000 |
| | Qingdao, Shandong | Sinopec | 2014 | 3 | 480,000 |
| | Rudong | PetroChina | 2011 | 3 | 530,000 |
| | Shanghai | CNOOC, Shenergy Group | 2009 | 3 | 495,000 |
| | Shanghai, Mengtougou | Shanghai Gas | 2008 | 3 | 120 000 |
| | Shenzen, Diefu | CNOOC | 2016 | 2 | 320,000 |
| | Tangshan, Hebei | PetroChina | 2013 | 3 | 480,000 |
| | Tianjin North | Sinopec | 2017 | 2 | 320,000 |
| | Yuedong, Guangdong | CNOOC | 2016 | 2 | 320,000 |
| | Zhoushan Zhejiang | Enn Group | 2018 | 2 | 320,000 |
| | Zhuhai, Gaolan | CNOOC | 2013 | 3 | 480,000 |
| Dominican Republic | Punta Caucedo | AES Andres | 2003 | 1 | 160 000 |
| Finland | Pori | Gasum Skangas | 2016 | 1 | 30,000 |
| | Tornio | Gasum Skangas | 2018 | 1 | 30,000 |
| France | Fos Tonkin | Elengy | 1972 | 3 | 150,000 |
| | Montoir-de-Bretagne | Elengy | 1980 | 3 | 360,000 |
| | Fos Cavaou | Engie, Total | 2010 | 3 | 330,000 |
| | Dunkirk LNG | EDF, Fluxys, Total | 2016 | 3 | 570,000 |
| Gibraltar | Gasnor | Shell | 2018 | 1 | 5,000 |
| Greece | Revithoussa | DEPA | 2000 | 3 | 225,000 |
| India | Dabhol | GAIL, NTPC (Ratnagiri Gas & Power) | 2009 | 3 | 480,000 |
| | Dahej | Petronet LNG | 2004 | 4 | 592,000 |
| | Hazira | Shell India, Total | 2005 | 2 | 320,000 |
| | Kochi, Kerala | Petronet LNG | 2013 | 2 | 320,000 |
| | Mundra | Gujarat State Petroleum, Adani Group | 2018 | 2 | 320,000 |
| | Kamarajar (Ennore), Tamil Nadu | Indian Oil, DFC, ICICI Bank | 2019 | 2 | 360,000 |
| Indonesia | Arun | Pertamina | 2015 | 5 | 507,000 |
| Italy | Panigaglia | Snam | 1969 | 2 | 100,000 |
| | Porto Levante (offshore GBS) | ExxonMobil, Qatar Petroleum, Edison Gas | 2009 | 2 | 250,000 |
| Japan | Negishi | Tokyo Gas | 1969 | 14 | 1,180,000 |
| | Sodegaura | Tokyo Gas | 1973 | 35 | 2,660,000 |
| | Ohgishima | Tokyo Gas | 1998 | 4 | 850,000 |
| | Higashi-Ohgishima | Tokyo Electric | 1984 | 9 | 540,000 |
| | Futtsu | Tokyo Electric | 1985 | 10 | 1,110,000 |
| | Yokkaichi LNG | Chubu Electric | 1988 | 4 | 320,000 |
| | Kawagoe | Chubu Electric | 1997 | 6 | 840,000 |
| | Yokkaichi Works | Toho Gas | 1991 | 2 | 160,000 |
| | Chita LNG Joint | Toho Gas, Chubu Electric | 1978 | 4 | 300,000 |
| | Chita LNG | Toho Gas, Chubu Electric | 1983 | 7 | 640,000 |
| | Chita - Midorihama | Toho Gas | 2001 | 3 | 600,000 |
| | Senboku I | Osaka Gas | 1972 | 4 | 180,000 |
| | Senboku II | Osaka Gas | 1977 | 18 | 1,585,000 |
| | Himeji | Osaka Gas | 1984 | 8 | 740,000 |
| | Himeji LNG | Kansai Electric | 1979 | 7 | 520,000 |
| | Yanai | Chugoku Electric | 1990 | 6 | 480,000 |
| | Niigata | Nihonkai LNG, Tohoku Electric | 1984 | 8 | 720,000 |
| | Oita | Oita Gas, Kyushu Electric | 1990 | 5 | 460,000 |
| | Tobata | Kitakyushu LNG | 1977 | 8 | 480,000 |
| | Fukuoka | Saibu Gas | 1993 | 2 | 70,000 |
| | Sodeshi | Shizuoka Gas | 1996 | 3 | 337,200 |
| | Hatsukaichi | Hiroshima Gas | 1996 | 2 | 170,000 |
| | Kagoshima | Nippon Gas | 1996 | 2 | 136,000 |
| | Shin-Minato | Sendai City Gas | 1997 | 1 | 80,000 |
| | Nagasaki | Saibu Gas | 2003 | 1 | 36,000 |
| | Sakai | Kansai Electric, Cosmo Oil | 2006 | 3 | 420,000 |

# LNG Import Terminals (continued)

| Country | Location (Project) | Owners | Start up | Storage Tanks | Storage Capacity |
|---|---|---|---|---|---|
| | Mizushima | Nippon Oil, Chugoku Electric | 2006 | 2 | 320,000 |
| | Sakaide | Shikoku Electric, Cosmo Oil | 2011 | 1 | 180,000 |
| Japan (continued) | Ishikari LNG | Hokkaido Gas, Hokkaido Electric | 2012 | 2 | 380,000 |
| | Okinawa | Okinawa Electric Power | 2012 | 2 | 280,000 |
| | Naoetsu | Inpex | 2013 | 2 | 360,000 |
| | Joetsu | Chubu | 2011 | 3 | 540,000 |
| | Hachinohe LNG | Nippon Oil | 2015 | 2 | 280,000 |
| | Hitachi LNG | Tokyo Gas | 2015 | 1 | 230,000 |
| | Soma Fukushima | Japan Petroleum Exploration | 2017 | 1 | 225,000 |
| Korea | Boryyeong | GS Energy, SK E&S | 2017 | 3 | 200,000 |
| | Incheon | Kogas | 1996 | 20 | 2,880,000 |
| | Kwangyang | POSCO | 2005 | 4 | 530,000 |
| | Pyeong-Taek | Kogas | 1986 | 23 | 3,360,000 |
| | Samcheok | Kogas | 2014 | 3 | 600,000 |
| | Tong-Yeong | Kogas | 2002 | 17 | 2,620,000 |
| Malaysia | Pengerang Johor | Petronas Gas | 2017 | 2 | 400,000 |
| Mexico | Altamira | Vopak, Enagas | 2006 | 2 | 300,000 |
| | Energia Costa Azul | Sempra LNG | 2008 | 2 | 320,000 |
| | Manzanillo | Samsung, Kogas, Mitsui | 2012 | 2 | 300,000 |
| Netherlands | Gate LNG | Gasunie, Royal Vopak | 2011 | 3 | 540,000 |
| Panama | Costa Norte | AES | 2018 | 1 | 130,000 |
| Phillipines | Pagbilao LNG | Energy World Corp. | 2017 | 1 | 130,000 |
| Poland | Swinoujscie | Baltic Gaz System | 2015 | 2 | 320,000 |
| Portugal | Sines | REN Atlantico | 2004 | 3 | 390,000 |
| Puerto Rico | Penuelas | EcoElectrica | 2000 | 1 | 160,000 |
| Singapore | Singapore | Singapore Energy Authority | 2013 | 3 | 540,000 |
| Spain | Barcelona | Enagas | 1969 | 8 | 840,000 |
| | Huelva | Enagas | 1988 | 5 | 610,000 |
| | Cartagena | Enagas | 1989 | 5 | 587,000 |
| | Bilbao | Enagas, EVE | 2003 | 3 | 450,000 |
| | Sagunto | GNF, Osaka Gas, Oman Oil | 2006 | 4 | 600,000 |
| | Mugardos, El Ferrol | Reganosa, Sonatrach, Sojitz Corp. | 2006 | 2 | 300,000 |
| | El Musel, Gijón, | Enagas | 2013 | 2 | 300,000 |
| Taiwan | Yung-An | CPC | 1990 | 6 | 690,000 |
| | Tai-Chung | CPC | 2009 | 5 | 800,000 |
| Thailand | Map Ta Phut | PTT LNG | 2011 | 2 | 320,000 |
| Turkey | Marmara Ereglisi | Botas | 1994 | 3 | 255,000 |
| | Izmir | EgeGaz | 2006 | 2 | 280,000 |
| USA | Everett | Suez LNG NA | 1971 | 2 | 155,000 |
| | Lake Charles | Shell, ETE | 1982 | 4 | 425,000 |
| | Freeport | Freeport LNG Development | 2008 | 2 | 320,000 |
| | 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 | Storage Capacity |
|---|---|---|---|---|---|
| China | Shenzhen | CNPC Yudean Power | 2021 | 2 | 120,000 |
| | Tianjin (Nangang) | Beijing Energy | 2022 | 10 | 2,000,000 |
| | Yangjiang | CNPC Yudean Power | 2023 | 2 | 120,000 |
| | Zhangzhou Fujian | CNOOC | 2022 | 2 | 160,000 |
| India | Dhamra Odisha | Indian Oil, Adani, GAIL | 2020 | 2 | 320,000 |
| | Jaigarh | Hiranandani Group | 2019 | 2 | 320,000 |
| | Kodinar | Hindustan Petroleum Corp. | 2022 | 1 | 160,000 |

# LNG FSRU Import Facilities

| Country | Location (Project) | Owners | Start up |
|---|---|---|---|
| Argentina | Bahia Blanca GasPort | Excelerate/YPF Repsol | 2008 |
| | Escobar GasPort | Excelerate/Enarsa | 2011 |
| Bangladesh | Moheshkhali | Excelerate, PetroBangla | 2018 |
| | Cox's Bazar | Summit Power International, Excelerate Energy | 2019 |
| Brazil | Pecem, FSRU | Petrobras | 2009 |
| | Guanabara Bay FSRU | Petrobras | 2009 |
| | Salvador, Bahia FSRU | Petrobras | 2013 |
| China | Tianjin FSRU | CNOOC, Hoegh, various | 2013 |
| Colombia | Cartagena FSRU | Promigas, Sociedad Portuaria El Cayao | 2016 |
| Egypt | Ain Sokhna, Suez | EGAS, Hoegh | 2015 |
| | Ain Sokhna, Suez | EGAS, BW Gas | 2015 |
| Indonesia | Lampung | Hoegh LNG, PGN LNG | 2014 |
| | Nusantara (Jakarta Bay) | Golar LNG, Pertimana | 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, Turquoise FLNG | Etki LNG | 2016 |
| | Dortyol FSRU Challenger | Botas | 2018 |
| UAE | Ruwais, Abu Dhabi | Gasco (UAE) | 2016 |
| | Jebel Ali Port, Dubai | DSA (UAE) | 2010 |

# LNG Export Projects

| Country | Location/Project | Project Developers | Planned Start Up | Number of Trains | Capacity In MTPA |
|---|---|---|---|---|---|
| AUSTRALIA | Pluto LNG expansion | Woodside | 2021+ | 2 | 10.0 |
| CANADA | Bear Head LNG, Nova Scotia | LNG Ltd. | 2024 | 4 | 8.0 |
| | Goldboro LNG, Nova Scotia | Pieridae Energy | 2024 | 2 | 10.0 |
| | Kitimat LNG, BC | Woodside, Chevron | 2024 | 2 | 10.0 |
| | LNG Canada, BC | Shell, Mitsubishi, Kogas, PetroChina, Petronas | 2024 | 2 | 12.0 |
| | Kwispaa FLNG, Vancouver | Steelhead LNG | 2024 | 4 | 12.0 |
| | Vancouver Tilbury | WesPac Midstream | 2021 | 1 | 3.25 |
| | Woodfibre LNG, Squamish | Pacific Oil & Gas Co | 2020 | 2 | 2.1 |
| EQ.GUINEA | Equatorial Guinea Fortuna FLNG | Ophir, Golar LNG, GEPetrol | 2020+ | 1 | 2.0 |
| INDONESIA | Sengkang LNG | Energy World Corp. | 2019 | 4 | 2.0 |
| MALAYSIA | Rotan FLNG (Sabah) | Petronas, Murphy Oil | 2021 | 1 | 1.5 |
| MOZAMBIQUE | Area 1 Onshore | Anadarko Petroleum and partners | 2023+ | 2 | 10.0 |
| | Area 4 Onshore | Eni and partners | 2023+ | 2 | 10.0 |
| | Area 4 FLNG | Eni and partners | 2022 | 1 | 3.4 |
| NIGERIA | NLNG Train 7 | NNPC, Shell, Eni, Total | 2022+ | 1 | 7.0 |
| PAPUA NEW GUINEA | Elk-Antelope LNG | Total, ExxonMobil Oil Search, Petromin | Studies | | |
| RUSSIA | Sakhalin II expansion | Gazprom, Shell, Mitsui, Mitsubishi | 2021 | studies | |
| | Vladisvostok LNG | Gazprom, Itochu, various | 2023+ | 2 | 10.0 |
| | Arctic LNG II Siberia | Novatek, Total | 2023 | 3 | 19.8 |
| USA | Alaska LNG Nikiski | Alaska Gasline Development Corp. | 2023+ | 3 | 20.0 |
| | Annova LNG, Brownsville | Exelon Corp. | 2023+ | 6 | 6.0 |
| | Commonwealth LNG, Louisiana | Commonwealth LNG LLP | 2023+ | 8 | 9.0 |
| | Delfin LNG, Louisiana | Delfin | 2023+ | 3 | 9.0 |
| | Driftwood LNG, Louisiana | Tellurian, Total and others | 2023 | 6 | 27.6 |
| | Galveston Bay LNG | NextDecade | 2023+ | 6 | 27.0 |
| | Golden Pass, Texas | Qatar Petroleum, ExxonMobil | 2024 | 3 | 15.6 |
| | Jacksonville, St John's River | Eagle LNG, Ferus Natural Gas Fuels | 2021+ | small | -1 |
| | Jordan Cove, Coos Bay | Pembina Corp. | 2024 | 2 | 7.8 |
| | Lake Charles, Louisiana | Shell, ETE | 2024 | 3 | 15.0 |
| | Magnolia LNG | Louisiana LNG Ltd. | 2023+ | 4 | 8.0 |
| | Port Arthur LNG | Sempra | 2023+ | 2 | 10.0 |
| | Rio Grande LNG | NextDecade | 2023+ | 6 | 27.0 |
| | Sabine Pass LNG, Louisiana | Cheniere | 2016-19 | 1 | 4.5 |
| | Texas LNG Brownsville | Chandra, Meyer, Samsung, others | 2023+ | 2 | 4.0 |
| | VG LNG (Cameron Parish) | Venture Global | 2022 | 5 | 12.0 |
| | VG LNG (Plaquemines) | Venture Global | 2022 | 10 | 20.0 |
| | VG LNG (Delta-Plaquemines) | Venture Global | 2024 | 36 | 22.5 |

# LNG Exporters

| Country | Location/Project | Shareholders | Start up | Liquefaction | | Storage | |
|---|---|---|---|---|---|---|---|
| | | | | Trains | capacity (nominal) mtpa | No. of tanks | Total capacity m³ |
| ABU DHABI (UAE) | Das Island (Adgas) | ADNOC, Mitsui, BP, Total | 1977 | 2 | 3.2 | 3 | 240,000 |
| | | | 1994 | 1 | 2.5 | | |
| 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 |
| ARGENTINA | FLNG Tango | Bahia Blanca | 2019 | 1 | 0.5 | 1 | 16,100 |
| 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 |
| | Ichthys LNG | Inpex Corp., Total | 2018 | 2 | 8.9 | 2 | 330,000 |
| | Prelude FLNG | Shell, Inpex, Kogas CPC | 2019 | 1 | 3.5 | | |
| BRUNEI | Lumut | Brunei/Shell/Mitsubishi/Total | 1972-74 | 5 | 7.2 | 3 | 176,000 |
| CAMEROON | Hilli Episeyo FLNG | Kribi Perenco | 2018 | 1 | 1.2 | 1 | 125,000 |
| EGYPT | Damietta | Union Fenosa, EGPC, EGAS | 2004 | 1 | 5.0 | 2 | 300,000 |
| | Idku | EGPC, EGAS, Shell, Total, Petronas | 2005 | 2 | 7.2 | 2 | 280,000 |
| EQ.GUINEA | Bioko Island | Marathon, Sonagas, Mitsui, Marubeni | 2007 | 1 | 3.4 | 2 | 272,000 |
| INDONESIA | Bontang I | Pertamina, VICO, JILCO, Total | 1977 | 2 | 5.2 | 5 | 635,000 |
| | Bontang II | | 1983 | 2 | 5.2 | | |
| | Bontang III | | 1989 | 1 | 2.8 | | |
| | Bontang IV | | 1993 | 1 | 2.8 | | |
| | Bontang V | | 1997 | 1 | 2.8 | | |
| | Bontang VI | | 1999 | 1 | 3.0 | | |
| | Sulawesi LNG | Medco Energi, Pertamina, Mitsubishi | 2015 | 1 | 2.0 | 1 | 170,000 |
| | Tangguh | BP, MI Berau, CNOOC, Nippon, LNG Japan | 2008 | 2 | 7.6 | 2 | 340,000 |
| MALAYSIA | Bintulu (MLNG Satu) | Petronas, Sarawak, Mitsubishi | 1983 | 3 | 8.1 | 4 | 260,000 |
| | Bintulu (MLNG Dua) | Petronas, Shell, Sarawak, Mitsubishi | 1995 | 3 | 7.8 | 1 | 65,000 |
| | Bintulu (MLNG Tiga) | Petronas, Shell, Sarawak, Mitsubishi, Nippon Oil | 2003 | 2 | 6.8 | 1 | 120,000 |
| | Bintulu Train 9 | Petronas | 2016 | 1 | 3.6 | | |
| | Kanowit FLNG | Petronas | 2016 | 1 | 1.2 | | |
| NIGERIA | Bonny Island | NNPC, Shell, Total, Eni | 1999 | 2 | 6.4 | 2 | 168,400 |
| | | Nigeria LNG (formed by above) | 2002 | 1 | 3.2 | 1 | 84,200 |
| | | Nigeria LNG | 2006 | 2 | 8.2 | | |
| | | Nigeria LNG | 2008 | 1 | 4.1 | 1 | 84,200 |
| NORWAY | Snøhvit/Melkoya | Equinor, Total, Petoro | 2007 | 1 | 4.2 | 2 | 280,000 |
| OMAN | Oman LNG | Oman Govt., Shell, Total, Korea LNG | 2000 | 2 | 7.1 | 2 | 240,000 |
| | | Mitsubishi, Mitsui, Partex and Itochu | | | | | |
| | | Oman Govt.,Oman LNG Union Fenosa, Osaka Gas, & Itochu | 2006 | 1 | 3.7 | 2 | 240,000 |
| PAPUA NEW GUINEA | PNG LNG | ExxonMobil, Oil Search, Santos, JX Nippon Oil | 2014 | 2 | 6.9 | 2 | 320,000 |
| PERU | Peru LNG | Hunt Oil, Shell, Marubeni, SK Group | 2010 | 1 | 4.4 | 2 | 260,000 |
| QATAR | Qatargas 1-T1&2 | QP, ExxonMobil, Total, Marubeni, Mitsui | 1997 | 2 | 6.4 | 4 | 340,000 |
| | Qatargas 1-T3 | QP, ExxonMobil, Total, Marubeni, Mitsui | 1999 | 1 | 3.1 | | |
| | Qatargas II-T1 | QP, ExxonMobil | 2009 | 1 | 7.8 | | |
| | Qatargas II-T2 | QP, ExxonMobil, Total | 2009 | 1 | 7.8 | 8 | 1,160,000 |
| | Qatargas III-T1 | QP, ConocoPhillips, Mitsui | 2010 | 1 | 7.8 | | |
| | Qatargas IV-TI | QP, Shell | 2010 | 1 | 7.8 | | |
| | RasGas I- T1&2 | QP, ExxonMobil, Kogas, Itochu, LNG Japan | 1999 | 2 | 6.6 | | |
| | RasGas II- T3 | QP, ExxonMobil | 2004 | 1 | 4.7 | | |
| | RasGas II- T4 | QP, ExxonMobil | 2005 | 1 | 4.7 | 6 | 840,000 |
| | RasGas II- T5 | QP, ExxonMobil | 2007 | 1 | 4.7 | | |
| | Rasgas III – T6 | QP, ExxonMobil | 2009 | 1 | 7.8 | | |
| | Rasgas III – T7 | QP, ExxonMobil | 2010 | 1 | 7.8 | | |
| RUSSIA | Sakhalin Island | (Sakhalin Energy) Gazprom, Shell, Mitsui, Mitsubishi | 2009 | 2 | 9.6 | 2 | 200,000 |
| | Yamal LNG Siberia | Novatek, Total, CNPC, Silk Fund | 2017 | 3 | 16.5 | 4 | 640,000 |
| TRINIDAD & TOBAGO | Point Fortin Train 1 | BP, Shell, CIC, NGC | 1999 | 1 | 3.0 | 2 | 204,000 |
| | Train 2 | BP, Shell | 2002 | 1 | 3.3 | 1 | 160,000 |
| | Train 3 | BP, Shell | 2003 | 1 | 3.3 | 1 | 160,000 |
| | Train 4 | BP, Shell, NGC | 2005 | 1 | 5.2 | 1 | 160,000 |
| USA | Cheniere Sabine Pass | Cheniere Energy | 2016 | 5 | 22.5 | 5 | 800,000 |
| | Cove Point LNG | Dominion Energy | 2017 | 1 | 5.3 | 7 | 695,000 |
| | Cheniere Corpus Christi | Texas Cheniere | 2018 | 2 | 9.0 | 3 | 480,000 |
| | Cameron Hackberry | Sempra, Total, Mitsui, Mitsubishi | 2019 | 2 | 9.8 | 3 | 480,000 |
| | Elba Island Georgia | Kinder Morgan, EIG Energy | 2019 | 10 | 2.5 | 5 | 535,000 |
| | Freeport LNG,Texas | Freeport LNG | 2019 | 2 | 10.2 | 3 | 483,000 |
| YEMEN | Bal-Haf | Yemen LNG, Total, Yemen Gas, Hunt Oil, SK Group, Hyundai | 2009 | 2 | 6.7 | 2 | 320,000 |

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