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China and India at centre of LNG surge as output projections change

World Energy Outlook from the France-based body looks at sector out to 2040

The United States produces more natural gas than the whole of the Middle East over the period to 2040 and Iraq with mostly associated gas and Mozambique with vast new offshore discoveries emerge as large gas producers from a low base.

The 785-page World Energy Outlook from the France-based International Energy Agency stated in its natural gas sector outlook for both LNG and pipeline gas that China's needs will prevail on the consumption front.

Expansion

The IEA says the massive expansion of natural gas production is having wide-ranging effects on the global liquefied natural gas balance by underpinning major investments in new liquefaction capacity despite low gas prices in both Europe and Asia.

"China, India and other developing Asian markets account for most of the increase in global gas trade to 2040," said the IEA.

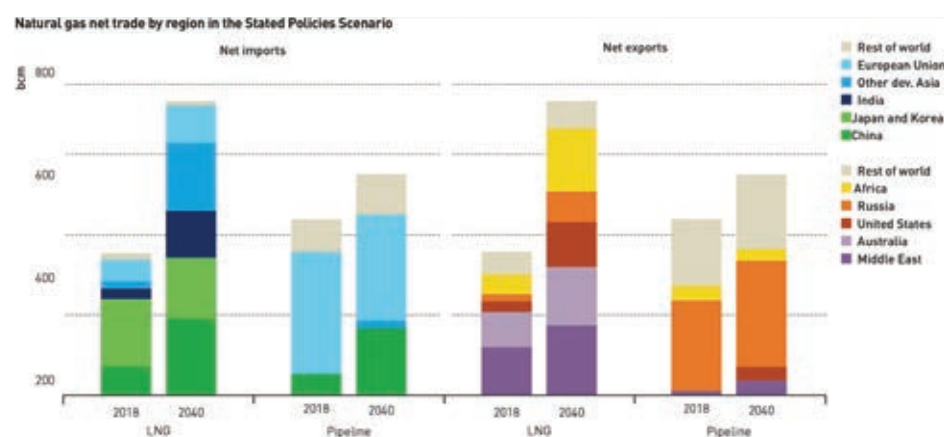
The report added in the section dedicated to natural gas that by 2040, China would be importing almost twice as much LNG as the next largest importing country, India, and the share of gas in China's energy mix rises from 7 percent today to 13 percent by 2040.

"By 2040, the average gas molecule travels over 5,000 kilometres to reach consumers in developing Asian markets, nearly twice as far as today," added the report.

In the natural gas sector both LNG and pipeline gas consumption will continue in China where it increased by 33 percent in the past two years.

US output

"The United States adds nearly 200 billion cubic metres to global natural gas production by 2025, over half of which is destined for export," stated the IEA report.



LNG dominates growth in the gas trade with Asia the leading customer (IEA)

Over the next two decades, global demand for natural gas grows more than four-times faster than demand for oil.

"Natural gas sees broad-based growth across the energy economy, in contrast to oil where growth is concentrated in parts of the transport sector (trucks, shipping and aviation) and petrochemicals," explained the IEA report.

Developing Asian economies account for half of the global growth in natural gas demand and almost all of the increase in traded volumes.

Pipelines

China overtook Japan as the largest gas-importing country in 2018 and its imports are projected to reach the level of the entire European Union by 2040.

LNG emerges as the preferred way of moving gas over long distances, growing by more than 3 percent per year through to 2040.

Pipeline gas increases at a more modest rate of 1 percent per year, with the increase primarily due to a tripling of China's pipeline imports.

This offsets declines in net pipeline imports into the EU in the latter half of the projection period, as the region takes higher volumes of LNG.

"By 2040, Asia consumes one-quarter of the world's gas production, much of it sourced from other regions," said the IEA.

"LNG dominates growth in global gas trade and technological and financial innovations are making LNG more accessible to a new generation of importers," said the IEA.

"The combination of a growing spot market and more destination flexibility are accelerating a move toward market-based pricing of LNG and away from oil-indexed pricing." It added.

"In the Stated Policies Scenario, the share of 'pure' oil-indexed import contracts in Asia declines from around 80 percent today to less than 20 percent in 2040," according to the IEA.

"There is significant uncertainty as to the scale and durability of demand for imported LNG in developing markets around the world," it said.

"LNG is a relatively high-cost fuel; investment in liquefaction, transportation and regasification adds a considerable premium to each delivered gas molecule," added the IEA.

Associated gas

"Competition from other fuels and technologies, whether in the form of coal or renewables, loom large in the backdrop of buyer sentiment and appetite to take volume or price risk," stated the report.

In other areas such as associated gas - a by-product of oil production - global



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volumes reached 850 billion cubic metres, around 20 percent of the world’s gas output.

Globally, only 75 percent of this gas is used by the industry or brought to market.

“We estimate that 140 Bcm was flared and 60 Bcm released into the atmosphere, more than the annual LNG imports of Japan and China combined,” explained the IEA.

“This significant source of emissions represents 40 percent of the total indirect emissions from global oil supply,” added the report.

Natural gas also resulted in 33 percent fewer carbon-dioxide emissions on average than coal per unit of heat used in the industry and buildings sectors, and 50 percent fewer emissions than coal per unit of electricity generated.

Coal-to-gas switching can therefore provide “quick wins” for global emissions reductions.

Theoretically, up to 1.2 gigatonnes of CO2 could be avoided using existing infrastructure in the power sector.

Power

“Doing so would bring down global power sector emissions by nearly 10 percent. With coal prices in 2019 in a \$60-\$80 per tonne range, most of this potential would require gas prices below \$4 per million British thermal units (MMBtu),” said the report.

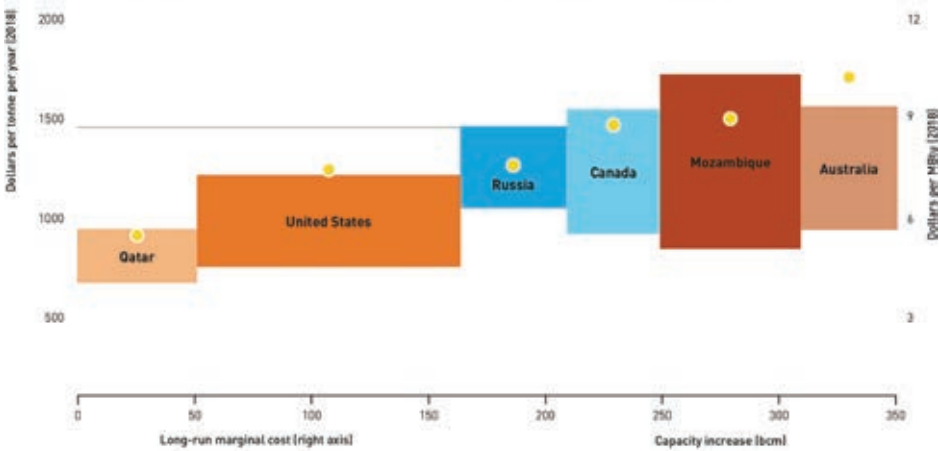
“Such prices are below the long-run marginal cost of delivering gas for many of the world’s suppliers, implying the need for additional policy support (in the form of carbon prices or regulatory intervention) to realise these emissions savings,” it added.

Near-term efforts introduced from January 2020 by member countries of the International Maritime Organization (IMO) to reduce sulfur emissions from shipping may provide a new

The outlook for natural gas relies heavily on LNG as a way to connect regional markets and bring gas to new consumers

market for LNG.

Investment cost ranges for liquefaction capacity and long-run marginal costs in the Stated Policies Scenario, 2018-2040



There are a wide range of investment costs for LNG such as feed-gas and shipping. LNG project economics sets the marginal price of gas in several markets, according to this graphic originated by the IEA

“The window of opportunity is relatively narrow and clouded by uncertainty about the lifecycle emissions intensity of LNG,” said the IEA.

“The IMO long-term strategy envisages an overall emissions reduction of at least half by 2050, compared with 2008. In this case, the maximum amount of emissions that could come from ships using LNG in 2050 is estimated to be 290 million tonnes of CO2,” it added.

Since 2010, 80 percent of the growth has been concentrated in three key regions: the US, where the shale gas revolution is in full swing; China, where economic expansion and air quality concerns have underpinned rapid growth; and the Middle East, where gas is a gateway to economic diversification from oil.

Key fuel

“LNG is the key to more broad-based growth for in 2019 it was already a record year for investment in new LNG supply, even as regional spot gas prices have fallen to record lows,” said the report.

It asserted that the stage appeared to be set for natural gas to thrive, at least in relative terms, over the coming decades.

“However, the headline findings should not obscure some important commercial and environmental challenges facing the gas industry, as well as some major variations in the storyline in different parts of the world,” added the IEA.

The outlook for natural gas relies heavily on LNG as a way to connect regional markets and bring gas to new consumers, especially in fast-growing parts of Asia.

“In a world where innovation is

bringing down costs in many areas, we ask how innovation might affect the outlook for LNG,” said the report.

“We explored four issues: the costs of LNG supply; the way that LNG is contracted; its environmental credentials; and the potential for demand-side innovation to unlock new markets,” added the IEA.

Consideration

The report considered how natural gas contributed to energy transitions when it competes with, and substitutes for, more polluting fuels, in particular coal.

“In the Current Policies Scenario, higher overall demand for energy pushes up natural gas consumption: demand for gas in this scenario increases by 2 trillion cubic metres (Tcm) by 2040, a level 50 percent higher than in 2018,” stated the report.

“In the absence of further support for renewables or efficiency policies, gas satisfies a third of total energy demand growth, and more than any other energy source,” it explained.

“The Middle East, North America and Eurasia each provide a fifth of the total additional volumes required in this scenario, with around 45 percent of global incremental production consumed in developing Asian markets, primarily in China,” added the IEA.

Compressed natural gas (CNG) and LNG both make inroads in the transport sector.

CNG is primarily used for passenger vehicles while LNG enters markets for shipping and large road vehicles such as trucks and buses.

“Demand starts from a low base of around 140 Bcm today, but grows to nearly 300 Bcm by 2040, spurred by increased use in China and the United States, and to a lesser extent in India and the Middle East,” said the IEA.

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Australian foundation LNG investor BHP expects market to advance more than most in energy sector

Commodities company analysis examines the corporate question of LNG attractiveness as an investment

The Anglo-Australian global commodities company BHP says liquefied natural gas can be an attractive exposure to the global natural gas market if you are the owner of an advantaged portfolio of assets as firm demand for gas is forecast to grow out to around 2050 while oil will peak before then.

BHP, a foundation investor in Australia's first export plant, the North West Shelf project that came on stream in 1989 and the latest project, the Woodside-operated Burrup Hub gas venture, said LNG stands in contrast to oil, where demand is seen peaking in either the mid-2020s (low case) or the mid-2030s (mid case).

Gas stakes

BHP's Burrup Hub interest comes from its 25 percent stake in the Woodside-operated Scarborough gas field.

The diversified nature of gas consumption, and its advantageous carbon profile within the fossil fuel universe, are its core strengths.

Demand is balanced across power generation, buildings (household and commercial) and industrial applications, allied to some emerging niches such as shipping

The global gas market is big and getting bigger - and the LNG share of the market could almost double to around one-fifth by 2050.

Demand, of course, has never been an issue where gas is concerned. Our commodity attractiveness framework though explicitly rejects demand-centric assessments.

Instead, we focus on what the future supply-demand balance says about the likelihood of the market being in 'inducement' more often than not.

We combine that analysis with assessments on the future size of the market; the presence of diversified drivers of demand vis-à-vis the rest of our portfolio; upstream focussed value chains and long run margin potential.

Cost curve

Margin potential is reasonably approximated by the shape of the long run cost curve.

Much of that is straight forward – with

the exception of "in inducement more often than not". So what do we mean by that?

There are two basic price formation regimes for commodity markets.

An inducement pricing regime is one where marginal supply in an industry is being met by new projects.

New projects require an expected return that, at a minimum, allows the developer to pay-back up front capital outlays and service ongoing creditor commitments.

Price regime

The price that solves for that required return is the "inducement price".

We also refer to this concept as "long run marginal cost" - LRMC.

The second price formation regime is one where marginal supply in an industry is being met by existing projects.

At a minimum, existing projects require compensation only for their short-run marginal costs - SRMC - which are, by definition, lower than LRMC.

Therefore, the margin which an incumbent producer can reasonably expect to earn in a LRMC price regime is higher than under SRMC - and thus we prefer industries where LRMC is expected to govern the provision of marginal supply most often.

So where does LNG fit? It's complicated.

First of all, we observe that a positive demand trajectory coupled to systematic on-stream decline creates a structural supply-demand gap across all our cases.

That implies, prima facie, that the LNG market meets the most important criterion for an enduring inducement pricing regime.

Abundant

That prima facie case is just the start of the conversation.

The underlying resource is geologically abundant. Upstream and midstream technologies are homogenous across the globe.

A new, global scale LNG project is large vis-à-vis the size of that particular segment of the industry, although the same issue does not arise for global gas proper.



BHP has gas and LNG assets in Western Australia and LNG-powered ship plans

These characteristics argue that despite the projected trend supply-demand gap, under a plausible chain of logic the LNG industry could easily find itself in a SRMC world for an extended period of time.

Waves

That logic might include an excess of committed supply targeting a projected future inducement window, thereby materially delaying its appearance; or demand under-performing expectations, for either macro or industry-specific reasons; or decision making by key actors being led by motivations other than pure commercial returns; or some combination of the above.

How do we synthesize that? The answer is that we foresee the LNG industry undergoing a number of inducement waves in the coming decades, as demand growth and base decline grind away, but these waves will be interspersed with pricing lulls that could be extended due to the lumpy nature of the prospective supply response leveraging off the abundant underlying resource.

So while we are confident that industry will need to induce considerable new supply, we can't be adamant that it will be in inducement pricing "more often than not".

The plausible low case forecasts that underpin our Capital Allocation Framework are the practical embodiment of this method of thinking.

In our most recent Outlook, complementing our six monthly financial reporting, we introduced readers to the contours of our low cases across the major commodities in our world-class portfolio.

This is the narrative for LNG:

Our low case for the LNG price is predicated on Qatar executing a market share strategy via the accelerated development of its North Field; Russian pipelines into Europe increasing market share by five percentage points; a low case macro environment curbing industrial and power demand; a "low carbon" case for renewables penetration competing with gas in the power sector; and a cluster of optimistic FIDs by 'portfolio players'; all of which serves to delay market balance by one full development cycle [from our central case timing of circa 2025].

Returns

It is obvious that if inducement pricing proved elusive for extended periods of time, highly capital intensive greenfield projects with long dated paybacks even under benign operating conditions would see their returns disappoint.

The conclusion is then that only advantaged assets will be truly resilient if future operating conditions prove to be underwhelming.

Advantaged assets are those that are already operating and are favourably placed on the cost curve; or for new projects, those positioned to reduce capital intensity through tie backs to existing infrastructure, whether owned

or where third-party ullage is available on fair commercial terms.

Favourable geographic positioning for access to gas-constrained consumer markets is an additional source of advantage. Assets that do not meet the above description will find it difficult to compete effectively for capital within BHP's portfolio of high quality options.

Another issue that we have raised as part of our strategic foresight program relates to the conventional wisdom on long run gas demand.

Insights derived from our investigation of the strategic theme of power decarbonisation have led us to question whether gas' future role as a transitional source of base load in emerging markets is sacrosanct.

Outcomes

Our investigations concluded that it is just as easy to envisage emerging markets with a young coal power fleet leap-frogging straight to renewables when those plants are due to retire.

That doesn't completely take away the growth premium enjoyed by gas in the long run, but it does take a little of the shine away.

The observation is most relevant for mega-LNG projects where a material element of the value is derived in from the mid-2030s and beyond, when such leap-frogging might occur.

There are additional characteristics of the LNG industry that will need careful watching over the coming decade.

The overarching trend is globalisation. This is most evident in the accelerated move towards price harmonisation in the last few years.

Going back a step or two, gas markets have historically been highly regionalised, with indigenous and pipeline import supply largely sufficient in the major geographies.

Depleting indigenous resource bases, a desire among customers to reduce concentration risks from cross-border pipelines, the strong price and demand signal in the late 2000s, early 2010s, that arguably led to both the US shale revolution and the era of mega LNG projects in Australia, and the US's accelerating tilt towards exports, have had a cumulative disruptive force on the historical dynamics.

Regional

While pricing remains nominally regional today, with a considerable portion of sales still under long-term contracts,

many of which remain oil-linked, global harmonisation is coming swiftly to the "islands" of North America, Europe, Asia and [eastern] Australia.

The introduction of flexible destination cargoes, the optimisation strategies of global equity portfolio players, more liquid spot markets and the increasing willingness of producers to sanction projects without sales pre-commitments, are all contributing to the process.

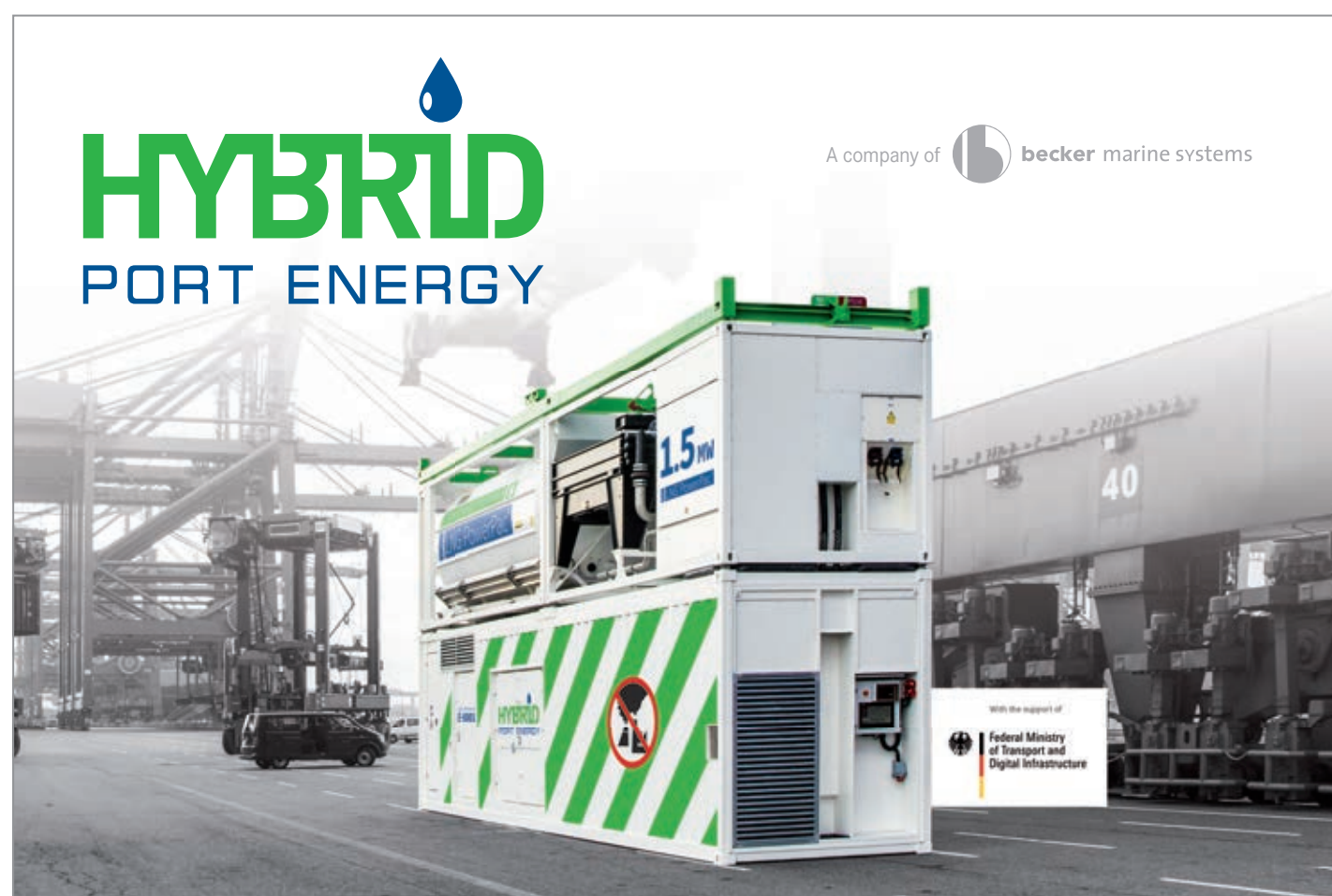
In the fullness of time, we feel that a global benchmark will become the natural pricing mechanism for traded LNG.

Henry Hub is one of the candidates for this longer term role, given the prominent nature of US export projects in the provision of marginal supply across our various cases.

Alternatively, a marker price from a major consumption region, either Europe or North Asia, could eventually fulfil

this function. Domestic markets such as eastern Australia, which are already being influenced by this transition, will be even more closely linked to international LNG pricing as these global forces roll onward.

This BHP LNG analysis is based on extracts from a report by Huw McKay, Vice President at BHP for Market Analysis & Economics.



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For the Record

ABS, the American Bureau of Shipping, said a small-scale LNG carrier, the world's first such vessel to be fitted with an innovative cargo containment system based on IMO requirements for independent type A tanks, has been delivered to the shipping line from the Chinese shipbuilders. The carrier, the "Saga Dawn with 45,000 cubic metres capacity, finally delivered to owners Saga LNG Shipping after earlier completing three weeks of gas trials. The small-scale carrier was constructed by China Merchants Heavy Industry at its Haimen shipyard located in the eastern Chinese province of Jiangsu. The "Saga Dawn" is the first to utilize the patented LNT A-Box-type cargo containment system. Saga LNG Shipping is a subsidiary of Landmark Capital, a Singaporean company with its base of operations in the Chinese city of Shanghai. "ABS has a track record of working with innovators in gas worldwide and we are proud that this project joins the list of successful projects," said Eric Kleess, ABS Senior Vice President for Eastern Hemisphere Operations. "Innovation is essential to move our industry forward and it is our mission to work with the designers and builders to harness the benefits of these designs while keeping safety at the forefront," explained Kleess.

The LNT A-Box system was developed by Singapore-based LNT Marine. It features an IMO independent prismatic type A tanks as the primary containment. The tanks are supported by laminated wooded supports and a liquid-tight thermal insulation attached to the hull compartment as an independent secondary barrier. "After nearly 10 years of research and development, we are delighted to see the completion and delivery of the first LNG carrier based on our LNT A-Box technology," said Kjetil Sjolie Strand, Chief Executive of LNT Marine. "We would like to thank CMHI, Saga and ABS for their excellent cooperation throughout the project," added the CEO.

ASIAN Infrastructure Investment Bank (AIIB), backed by the Chinese government, said it was investing \$500 million in an LNG import project near Tianjin port in

northeast China to help support efforts to reduce air pollution. AIIB said it would finance the construction of LNG receiving, storage and regasification facilities in Binhai district in Tianjin. The project is AIIB's first sovereign-backed financing in China. "Upon completion, the project will cut coal consumption by about 11.9 million tonnes annually and help improve air quality by reducing coal combustion-related emissions in Beijing, Tianjin and Hebei province, an economic engine in north China," said the bank. The project will be under the management of state-run Beijing Gas Group Co. "The project will support China's efforts to fulfil its commitments under the Paris Agreement, and strengthen and contribute to the global response to the threat of climate change," said AIIB Vice President and Chief Investment Officer D.J. Pandian. "It aligns well with AIIB's commitment to sustainable energy for Asia and reducing the carbon intensity of energy supply," added Pandian.

AIIB began operations in January 2016 and has grown to 100 approved members worldwide, with China its biggest shareholder. The bank said in July 2019 that it aimed to finance from \$10 billion to \$12 billion worth of projects annually in coming years. "With a population of around 112.7 million, the Beijing-Tianjin-Hebei region is one of the most important economic engines within China," said the bank. "However, it has been facing the dual challenges of increasing energy demand and addressing air pollution, which directly affect the quality of life of local residents," it explained. "Reducing coal consumption will also deliver the co-benefit of improving air quality. To meet its environmental commitments and still ensure adequate gas supply to maintain peoples' livelihoods, an emergency reserve capacity is required," stated the AIIB.

AUSTRALIAN liquefied natural gas production in the third quarter of 2019 represented an annualised rate of 79.5 million tonnes, keeping the nation in the No. 1 spot of global producer, ahead of Qatar's nameplate capacity of 77 MTPA. The output reached a record 20.0MT in the third quarter, up from 19.3MT in the second quarter and 18.1MT in the same three months a year ago, according to a report from consulting firm EnergyQuest.

"We expect total Australian shipments to be about 82MT in the 2020 fiscal year," said EnergyQuest. Following the commissioning earlier in 2019 of the Royal

Dutch Shell-operated Prelude FLNG plant offshore northwest Australia, national nameplate liquefaction capacity rose to 87.45 MTPA. However, EnergyQuest said that the last quarter had seen dramatic declines in international energy prices compared with a year earlier. "The biggest falls have been in spot LNG and coal but oil has also experienced a significant decline," it added. "However, the long-term oil-linked contracts that underwrote Australia's LNG investment boom are still quarantining local producers from a global LNG glut that has taken Asian spot prices to a 10-year low," explained EnergyQuest.

The Australian LNG price in the third quarter was between US\$7.60 per MMBtu and US\$8.80 per MMBtu. During the quarter, the Australian East Coast natural gas market posted its largest surplus since LNG exports began from the three coal-seam-gas-to-LNG plant on Curtis Island near Gladstone in Queensland. Natural gas production reached a record 500.1 petajoules during the three months with the new Northern Gas Pipeline supplying 6.1 petajoules, and amounting to a total increase in supply of 26.5 petajoules from the previous quarter. "This is the largest East Coast surplus since the beginning of LNG exports and a dramatically better outcome than in the third quarter of 2018 when there was a deficit," stated the report. The LNG plants, Queensland Curtis, the Gladstone and Australia-Pacific LNG supply the main North Asian nations such as China, Japan and South Korea. Australia-Pacific, operated by ConocoPhillips, ships cargoes to Chinese major Sinopec, which has a 7 million tonnes per annum contract, while the Shell-owned QCLNG delivers many cargoes to southern China. "Record CSG production allowed Queensland's LNG projects to satisfy political pressure to supply more gas to the domestic East Coast market while modestly increasing gas exports," explained EnergyQuest. The firm noted that the Queensland prices were lower than those in the South of Australia and the significant fall in prices was likely to weaken the case for tightening the Australian Domestic Gas Security Mechanism (ADGSM) to guarantee domestic supplies. The report added that the domestic market in Western Australia, where four onshore LNG plants operate and one FLNG facility, was "awash with gas".

CEDAR LNG in Canada, a proposed floating export plant backed by the Haisla

First Nation in the province of British Columbia, is the subject of a funding offer for citizens to take part in the Canadian federal government's impact assessment as the venture moves forward. The processing and export venture is seeking permission to construct facilities near the town of Kitimat, where Royal Dutch Shell is building the LNG Canada plant with up to 20 million tonnes per annum of output. The Cedar project would process and liquefy natural gas to produce only 4 MTPA of LNG and would include storage capacity of up to 250,000 cubic metres. In addition to the LNG project, the Haisla First Nation also has an accord with the Pacific Trail Pipeline project to bring shale-gas from northeast BC to the Pacific Coast near Kitimat. The Haisla are hoping to develop their own project to generate employment and shared revenues, though under commercial terms.

The Impact Assessment Agency of Canada said it was making funding available through its Participant Funding Program to assist the participation of the public and Indigenous peoples in the federal impact assessment for the venture. "Funding is available for eligible individuals and groups to assist their participation in upcoming steps of the impact assessment, specifically for reviewing and providing comments on the draft information requirements that will inform the assessment," said the agency. "Once this phase is complete, the public and Indigenous groups will have another opportunity to apply for funding to assist their participation in the next phases of the impact assessment process," it added. It stressed that only applications received by January 6, 2020, will be considered. The Government of BC has requested that the conduct of the federal impact assessment process be substituted to the province. "This means if the Agency determines an impact assessment is required, and the Minister of Environment and Climate Change decides that the provincial process is an appropriate substitute for the federal process, the provincial government would conduct the assessment," it explained. As a next step, the Agency will determine whether a federal impact assessment is required for the project and if one is required, recipients and the amount of funding allocated will be announced soon.

ELENGY, the French import terminal operator, said the Montoir-de-Bretagne facility in Western France was fully booked between 2023 and 2035 with only

a small portion of capacity available in 2021 and 2022. Elengy, a subsidiary of GRTgaz and whose ultimate owner is the French utility group Engie, said it had offered around 3.5 billion cubic metres of gas per year of not yet unsubscribed capacity between July and November and it was all taken up. “As a result, the Montoir-de-Bretagne terminal is now fully booked between 2023 and 2035,” the company said. “This result reflects the dynamism of the LNG market, as well as the appetite for regasification capacity in France, gateway to North-West Europe gas markets,” it said. Elengy added that, in order to meet market expectations, it would study options for offering capacity at the Fos Cavaou LNG terminal near the southern city of Marseille beyond 2030, and at Montoir-de-Bretagne beyond 2035.

It said the two sites offered direct and attractive access to European markets, with strategic positions on the Mediterranean and Atlantic coasts, making them competitive LNG hubs for reloading, transshipment, bunkering and truck loading. The French gas network operators GRTgaz and Terega said last week that LNG flows through the French gas network had doubled in the past year as its strategic position and improved infrastructure makes it an attractive destination for LNG. GRTgaz and southern network Terega said they expected all demand to be met for French gas customers this 2019-2020 winter, “even in the case of exceptional peak cold weather demand.” “This analysis is based on the capacities offered to shippers as well as their subscription levels to feed the network at the various points of entry and exit (interconnections at borders, LNG terminals, underground storage),” said GRTgaz.

GRTgaz has said that the Fosmax consortium that owns the Fos Cavaou terminal near Marseille is considering plans to more than double send-out capacity from 8 Bcm to 16.5 Bcm in two phases from 2022 to 2024. The French network operator has overseen an improvement in French security of supply and the integration of the European and French markets were reinforced by the creation last year of a new gas import point. This point is at Oltingue in the Haut-Rhin department in Eastern France and it was accompanied by the commissioning of the Val de Saone pipeline and Gascogne-Midi projects that joined French gas markets in the North and the South. The completion of this major project, the last link in a decade of

investments, also allowed the creation of the Trading Region France (TRF) single market place for natural gas in November 2018.

FLEX LNG, the growing shipping company with six vessels operating and seven others on order and whose largest shareholder is a company controlled by Norwegian magnate John Fredriksen, has entered into a new time charter in what is its second deal in a month. The charter for the 174,000 cubic metres capacity carrier “Flex Ranger”, which was delivered in 2018, is for a period of 12 months. The charterer Endesa, a subsidiary of the Enel Group, is a leading Spanish utility with significant business in neighbouring Portugal. The firm period under the new charter will commence in continuation of an existing time charter with Enel expiring on or about June 2020. Endesa will also have the option to extend the time charter by an additional 12 months. “We are pleased to announce that Endesa has elected to time charter ‘Flex Ranger’ in direct continuation of our existing time charter with Enel when this expires in June next year,” said Oystein M. Kalleklev, Chief Executive of Flex LNG Management AS. “This charter party adds additional revenue backlog to a first-class charter in line with our communicated strategy,” added Kalleklev.

Flex said on 25th of November 2019 that it had arranged a time charter with a subsidiary of commodities firm Gunvor. The charter period agreed between Flex and Gunvor unit, Clearlake Shipping Ltd, is for a firm five years with a further five-year option. The vessel booked by Gunvor is currently being constructed at Daewoo Shipbuilding and Marine Engineering and is known as Hull 2479, though is likely to be named “Flex Artemis”. With 173,000 cubic metres capacity, the carrier is scheduled for delivery in August 2020. The ship is fitted with two-stroke, slow-speed and electronically-controlled, gas-injection M-type (ME-GI) engines. It will also be equipped with a Full Reliquefaction System (FRS) enabling a high level of operational flexibility given the low boil-off rate of 0.035 percent per day.

GLENCORE, the UK-listed commodities and mining company, has agreed to take over a loss-making liquefied natural gas business from Danish energy company Orsted, including long-term capacity at the Dutch Gate regasification terminal in Rotterdam. Orsted announced the deal and explained

how it had entered into an agreement in 2007 with the LNG import terminal in Rotterdam regarding the right to use 3 billion cubic metres of annual regasification capacity from 2011 to 2031. The Danish company’s LNG business consists of the Dutch Gate capacity and five LNG purchase agreements. “The transaction entails a payment from Orsted to Glencore and will result in a loss that exceeds our current provision related to the LNG activities,” stated Copenhagen-based Orsted without saying how much Glencore was being paid.

Anglo-Swiss company Glencore is seeking to increase its LNG profile to match commodities market rivals Gunvor, Vitol and Trafigura. The firm has growing LNG trading operations in Asia and Europe and competes globally for supply tenders. “Even though Orsted’s LNG team has performed well during the last few years, the business has been loss-making and is projected to remain so for years to come,” said the Danish company. “Further financial improvements would require further contractual commitments,” it explained. “With Orsted’s global expansion in renewable energy, it is clear that LNG trading will not be a part of Orsted’s future core business, and it is therefore being divested,” added the statement. Orsted, whose other main businesses are in wind and solar energy, said completion of the transaction was dependent on the fulfilment of a number of conditions and was expected to take place in mid-2020.

GTT, the French technology firm for designs of systems for the maritime transportation and storage of liquefied natural gas, said it signed a technical and licensing agreement with Chinese shipbuilder Wison Offshore and Marine for a range of LNG vessels. The assistance accord and licensing covers floating LNG production hulls, Floating Storage and Regasification Units (FSRUs), Floating Storage Regasification and Power (FSRP) units and conventional LNG carriers. Wison is a pioneer in floating LNG in China, being the first in the world to deliver a barge-based FLNG production hull and an FSRU. The Chinese yard has now obtained its GTT licensing deal after having successfully completed a qualification process that began earlier in 2019, including the construction of a Mark III technology storage tank mock-up. “This agreement will enable both partners to further expand their offering to ship owners, to target new markets,

especially focusing on floating based solutions, and to advance the development of LNG in the global supply chain,” said a GTT statement.

The Wison yard in Nantong port in the eastern province of Jiangsu delivered the FLNG production hull currently deployed at the port of Bahia Blanca in Argentina, the “FLNG Tango”. The yard also constructed the world’s first barge-based FSRU. Both the LNG production barge and the FSRU were delivered to Belgian shipping line and project company Exmar. “We are pleased to count Wison among our newbuilding partners,” said Philippe Berterroitière, Chairman and Chief Executive of GTT. “We are very interested in developing and building together new LNG infrastructures which can provide innovative natural gas value chain solutions,” added the CEO. The President and Chief Operating Officer of Wison, An Wenxin, said the company was delighted with the deal. “We are very proud to be licensed by GTT for membrane technologies. This will allow us to offer more actively LNG solutions with GTT’s technologies in China, which is what the market is asking for,” stated the COO. In its most recent earnings, GTT reported a jump in nine-month revenues as its order book rose to 120 units. GTT said that at the end of September 2019 its orders included 100 conventional LNG carriers, six ethane carriers, six FSRUs, two floating LNG production vessels, three gravity-based structures and three onshore storage tanks.

INDIA will soon have another completed LNG import terminal in operation. The Mundra LNG terminal in the state of Gujarat, was expected to receive its first cargo in January after being mechanically completed about a year ago and now issuing a tender. The Mundra facility is co-owned by Gujarat State Petroleum Corp. (GSPC) and the Adani Group. Executives said GSPC issued a tender on December 16 seeking a cargo to be delivered in the second half of January 2020. The tender closes on December 18. 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. Indian Prime Minister Narendra Modi inaugurated the Mundra terminal in October 2018 before it was ready for a commercial start-up.

The terminal at Mundra Port 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 LNG carriers. Prime Minister Modi said at the time that “Gujarat is emerging as an LNG hub” of India. GSPC constructed the facility even as a proposed deal with other partners had yet to be finalized. Indian Oil Corp. completed India’s only East Coast terminal at Kamarajar Port earlier in 2019 amid a dearth of commercial contracts for regular deliveries. India’s four currently operating import terminals are at Hazira, Dahej and Dabhol near Mumbai and at Kochi in the southwest state of Kerala. The 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 terminal’s commissioning started on February 26 in 2019 with the arrival of an LNG cargo from Qatar. Indian PM Modi then inaugurated the first Indian East Coast terminal at the start of March has the first delivery was completing the cool-down of the facility.

LAKE CHARLES LNG, the US export project being pursued by pipeline and midstream company Energy Transfer and Royal Dutch Shell, has issued a tender package for engineering, procurement, and construction and for contractors to submit firm bids. The Lake Charles facility was the longest-serving US import terminal before the shale-gas boom and previously imported cargoes from Trinidad and Equatorial Guinea. Under the transformation, Lake Charles will become an export facility with capacity to ship 16.45 million tonnes per annum. Bids from the leading LNG engineering companies and joint ventures are expected to be received by the Lake Charles project by the second quarter of 2020. The commercial tender expands on the invitation to tender announced in May 2019 that focused on the technical scope of the project, specifically verifications of the engineering and design of the liquefaction facility. “This is an important step in the continued development of this LNG project with Shell,” said Tom Mason, President of Energy Transfer LNG. “This project capitalizes on repurposing existing brownfield regas assets to achieve cost savings in the construction of the liquefaction facility,” added Mason. “The

project will also benefit from the unique strength of Energy Transfer as a leading natural gas pipeline operator with extensive connectivity to the Lake Charles facility,” he stated.

EPC contractors are invited to make “comprehensive commercial bids for the lump-sum, turnkey contract based on a fully developed scope related to design, engineering, technical and safety specifications for the construction, commissioning, and start-up” of the Lake Charles plant. Energy Transfer and Shell have signed a framework agreement designating Shell as the project leader and as construction manager and operator of Lake Charles LNG when it is finally sanctioned. Energy Transfer will be site manager and project coordinator prior to the final investment decision. Shell said the commercial tender represented another important landmark on its phased approach to developing a credible and safe LNG project with Energy Transfer.

“We look forward to continue leveraging our global experience in LNG development and build on our positive collaboration with EPC contractors to drive value and competitiveness throughout the bid process,” said Frederic Phipps, Shell, Vice President of the Lake Charles project. The Federal Energy Regulatory Commission has authorized a deadline for the Lake Charles plant to be completed by mid-December 2025. The Lake Charles export project had received a draft environmental impact statement from the FERC as far back as September 2015. Shell gained its stake in the Lake Charles facility from its takeover in 2015 of BG Group of the UK. The export project will include the construction of three liquefaction Trains and will use the existing LNG storage and marine berthing facilities owned by Equity Transfer since its takeover of Southern Union Co. in 2013 for more than \$5 billion.

The Lake Charles venture was first awarded a permit by the Department of Energy in August 2013 to ship cargoes to countries without a US Free Trade Agreement. Now the volumes for that permit have been increased. BG and Energy Transfer had previously scheduled a commercial start-up for the plant as an exporter in 2019. The 440-acre site is located close to the Henry Hub with access to many of the largest natural gas production areas in the US through Energy Transfer’s existing and new pipelines like the Trunkline Gas System. The Trunkline Gas System amounts to a

2,200-mile pipeline that interconnects with more than a dozen inter-state and intra-state pipelines to ship feed-gas to Lake Charles LNG and other projects along the Gulf Coast. Energy Transfer began in 1995 as a small intra-state natural gas pipeline operator and is now one of the largest energy infrastructure firms in the US. Lake Charles would be Shell’s largest liquefaction foothold in North America, rivalling its LNG Canada joint venture in the province of British Columbia.

CME Group, the global exchange and energy and commodities derivatives trading and clearance platform operator, has started offering the first futures contracts for liquefied natural gas freight. CME, which is the former Chicago Mercantile Exchange, launched the LNG freight futures on December 23, 2019. “Following the recent launch of our physically delivered LNG futures contracts and alongside our benchmark Henry Hub futures and growing European Gas and JKM contracts, these new LNG freight futures contracts provide the missing link to allow counterparts to hedge their exposure along the full gas supply chain,” said a CME statement. “The biggest unhedged risk (on the LNG market) is on the freight side,” it added.

“We have had a lot of demand from brokers and traders and are launching the LNG freight contracts as soon as possible,” stated CME. The contracts offered are based on the assessment of three LNG shipping routes that the London-based Baltic Exchange started publishing earlier this year. The Baltic Exchange collects data from shipping brokers to provide assessment of three routes: 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.

There have been several over-the-counter (OTC) deals via brokers based on the Baltic Exchange’s assessments, including between French major Total and commodities firm Glencore in July 2019 and Japan’s JERA Global Markets and commodities firm Vitol in September. “OTC activity is a good indicator for us,” said CME. “Clearing via the exchange will bring this trade to the next level,” it added. CME noted that LNG freight futures will be available on the New York Mercantile Exchange (Nymex) for trading. So far, multi-month charters of physical vessels have been the major tool

to hedge price fluctuations on the LNG shipping market. “Strong volatility in shipping rates last year, when charter rates for LNG tankers doubled between August and October, increased the need for financial products to mitigate price risks,” said CME. CME previously launch a futures contract in October 2019 for LNG linked to physically delivered volumes from Cheniere’s Sabine Pass plant. The contract called the US LNG Export futures contract started trading on October 14 and has 24 delivery months. This means that a market participant can buy an August 2021 LNG cargo, for example, and trade it up until the delivery date.

DELEK Group, the Israeli company developing the Leviathan gas field offshore Israel with Noble Energy of the US, started first gas deliveries in December 2019 and ongoing plans for a floating LNG project. Delek outlined its proposals as it reported third-quarter revenues of 2.0 billion Israeli shekels (\$578 million) compared with \$2.2Bln (\$651M) in the same three months of 2018. Nine-month revenues were 6.04Bln shekels (\$1.75Bln) versus 6.11Bln shekels (\$1.76Bln) in the same period of 2018. The Israeli Leviathan gas field has resources of around 21.4 trillion cubic feet while the Tamar gas field reserves are 11.2 Tcf. Other Delek-Noble interests in the Eastern Mediterranean include the Aphrodite gas field offshore Cyprus with an estimated 4 Tcf of recoverable resources. Delek’s share of revenues from oil and gas sales, net of royalties, totaled 1.01Bln shekels (\$291M) compared with 1.06Bln (\$305M) million in the same period last year. However, net profit tumbled to 141M shekels (\$40.6M) from 587M shekels (\$169M) in the year-ago quarter.

The company East Med energy operations are carried out by its subsidiary, Delek Drilling. In the reporting period, the bulk of Delek Drilling’s revenues derived from gas sales from the Tamar gas field offshore Israel. Delek said the Leviathan field have contracts to supply natural gas to Egyptian company Dolphinus Holdings via the East Mediterranean Gas (EMG) pipeline. The EMG pipeline runs from Ashkelon in Israel to El Arish in Egypt. Both Delek and Noble said that the mechanical integrity of the EMG pipeline had been confirmed and certified by a third party. “The EMG pipeline was flow-tested from Israel into Egypt, confirming sales capability,” said Delek.



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“In studying options for increasing production output in the Leviathan Reservoir Delek Drilling and the other Leviathan partners signed two separate interim agreements on July 29 with technology and FLNG service providers,” noted the company. “These agreements concern suitability studies and detailed engineering design works for building an FLNG facility for the Leviathan Project in Israel’s exclusive economic zone,” it stated. Delek said its Ithaca subsidiary, which recently completed the purchase of UK North Sea assets from Chevron Corp., posted revenues in the reporting period of \$267M compared with \$255M million in the same period last year. Delek also signed an agreement with a number of institutional investors to sell all of its direct rights to overriding royalties from the Tamar and Dalit gas field reservoirs. The Israeli company said in November that Asaf Bartfeld, the current Chief Executive of Delek, has retired after serving in various functions at the company for more than 30 years. He was succeeded from January 2020 by Idan Wallace, currently deputy CEO. Wallace, deputy CEO since 2015, is also the deputy CEO of the Tshuva Group of private companies owned by Yitzhak Tshuva, Delek Group’s controlling shareholder.

GERMAN technology has been chosen for the first floating liquefaction and export plants being developed offshore Senegal and Mauritania in West Africa by BP of the UK and Dallas-based Kosmos Energy. Linde AG of Germany, whose headquarters are in Munich, said it was selected for phases 2 and 3 of the Greater Tortue-Ahmeyim project where it will be the liquefied natural gas technology licensor. Shareholders in the FLNG project in addition to BP and Kosmos are the state energy companies of both African states, Société des Pétroles du Sénégal (Petrosen) and Société Mauritanienne des Hydrocarbures et de Patrimoine Minier (SMHPM). BP is operator of the Greater Tortue-Ahmeyim venture, the deepest offshore project in Africa to date, and located on the maritime border between Mauritania and Senegal.

Under the terms of the signed master agreement, Linde will provide technology licensing services, based on Linde’s patented mixed fluid cascade liquefaction technology, first used at the Hammerfest LNG plant in Norway with Equinor, formerly Statoil, and since developed. “Linde will also manufacture and supply the related cryogenic coil wound heat

exchangers, subject to a future call-off,” said the German company. All other engineering contracts have been awarded and the first gas from the Kosmos-BP FLNG Train 1 is scheduled for around 2022 and the start of the second FLNG Train is set for 2023. “Being selected by a world-class oil and gas major like BP for a complex project is another milestone in successfully implementing our natural gas liquefaction technology around the globe” said Christian Bruch, Executive Vice President Linde plc and CEO of Linde Engineering.

“We are looking forward to working closely together with BP to support them in the successful execution of this project,” added Bruch. “The Linde MFC2@ liquefaction technology is both compact and highly energy efficient, making it well suited to offshore projects,” stated the executive. Linde is among Europe’s leading industrial gases and engineering company with sales last year of US\$28 billion and a global workforce of 80,000 people. BP and its partners are already progressing with Greater Tortue-Ahmeyim field development and the FLNG requirements. Other contracts have already been awarded for the Tortue-Ahmeyim venture to US engineering companies such as KBR Inc., McDermott International and Baker-Hughes. Kosmos was the original successful explorer of the Senegal-Mauritania reserves and agreed to sell BP around 60 percent of the licences in 2016 with the UK major taking over operatorship. The US company retained around 30 percent of the Senegal fields and licence and about 28 percent of the project’s Mauritania holdings. BP and Kosmos have made major natural gas discoveries since the Tortue-Ahmeyim venture began, including at the Orca-1 exploration well offshore Mauritania.

INPEX Corp. of Japan has achieved completion of the project financing contracts for its Ichthys LNG export plant at Bladin Point near Darwin in the Australian Northern Territory after costs and delays multiplied over several years. The Ichthys project’s final cost is estimated to be around US\$40 billion. This far exceeds a 2012 cost estimate of US\$34Bln for the project, which was beset with many delays. The plant has a nameplate capacity of 8.9 million tonnes per annum of LNG with prospects for future expansion. Inpex holds 62 percent of the shares with French energy major Total as the second-largest stakeholder

with 30 percent. “Approximately 70 percent of the LNG produced is scheduled to be supplied to Japanese customers,” said Inpex. “Through the project, Inpex is poised to contribute further to the stable supply of energy to Japan while responding to the energy demand in Asia and around the world,” it added. Smaller stakes in the venture are held by foundation customers such as the Japanese utilities, Tokyo Gas, Osaka Gas, Kansai Electric Power, Jera Co. Inc. and Toho Gas, as well as CPC Corp. of Taiwan.

Most recent Australian LNG export projects have suffered cost overruns and delays. Chevron’s 15.6 MTPA Gorgon LNG project saw its costs soar from US\$37Bln to US\$54Bln as its completion date also slipped from 2014 to 2016. The Santos-operated Gladstone LNG plant in Queensland had an original price tag of US\$16Bln and final costs rose to US\$18.5Bln. The Inpex-led project suffered labor disputes and delivery backlogs for equipment as well as several other issues that held up work. There was also the challenging 890-kilometres offshore pipeline construction to connect with the Bladin Point liquefaction plant. “The financing framework has now released Inpex and its joint venture partners from completion guarantee obligations to lenders corresponding to their respective participating interests in the project,” said the Japanese company in its statement. “Financial completion is contingent upon the satisfaction of all components of a 90-day financial completion test that evaluates the performance of the natural gas liquefaction plant, including the cumulative production volume calculated over the 90-day period as well as operational continuity,” explained Inpex.

“The project’s 90-day financial completion test ended successfully on December 7, 2019 with no shutdowns, having recorded a production volume well exceeding figures stipulated in the project financing contract,” stated the company. The timespan was of 14 months from the project’s first LNG shipment on October 22, 2018, until financial completion. Inpex is also a shareholder in the Royal Dutch Shell-owned Prelude FLNG venture offshore northwest Australia. The Anglo-Dutch company and Inpex are also embarking on the Abadi LNG joint venture onshore Indonesia and Inpex has said it is taking with it lessons learnt during construction of Ichthys LNG. Inpex and Shell recently made a firm decision with the Indonesian government

on the location for their onshore plant using feed-gas from the Abadi gas field in the Masela Block in the Arafura Sea offshore Indonesia. The liquefaction and export plant will be constructed on Yamdena Island and is expected to be operational by around 2027 with Inpex already completing preliminary front-end engineering design for a facility with an annual initial capacity of 9.5 million tonnes. Indonesia’s state oil and gas regulator, the Upstream Oil and Gas Regulatory Special Task Force, said it had sent a formal recommendation letter to the Maluku provincial administration asking to have the liquefaction plant on Yamdena Island. The Indonesians also approved the application for a seven-year additional time allocation earlier in 2019 and a 20-year extension to the Production Sharing Contract (PSC) for the Masela Block, extending the term of the PSC until 2055.

JAPANESE liquefied natural gas imports dropped last month and cost around 18 percent less than a year ago as the nation continued to reduce its annual cargo requirements, though Australian shipments remained substantial. The volume of LNG cargoes delivered to Japan in November fell by 1.2 percent to 6.27 million tonnes compared with 6.34MT in November 2018, according to preliminary figures from the Ministry of Finance. This volume of deliveries amounts to around 90 cargoes. Imports in October had fallen by 3.6 percent to 6.30MT compared with 6.53MT in October 2018. According to estimates, Japan is on track to import around 77.80MT for all of 2019, if the volumes received in December are in line with last year. That would be 5.04MT less than the 82.85MT imported in 2018 and 5.83MT below the 83.63MT of cargoes delivered in 2017.

The cost of the November cargoes dropped by 18.4 percent to 333.48 billion yen (\$3.05Bln) last month versus November 2018 when the cost of shipments was 408.83Bln yen (\$3.76Bln).

October deliveries of thermal coal, a competitor to LNG, also fell. Coal imports for power plant use came to 8.86MT, a plunge of 12.4 percent on November 2018 as seasonally mild weather curbed demand. The Ministry’s data for November showed a year-on-year fall in Middle East cargoes for an eight successive month on fewer long-term volumes from Abu Dhabi. The November 2019 shipments from countries like Qatar, the United Arab Emirates and Oman

totaled 1.18MT, down 9.5 percent from October 2018. Asian LNG cargo deliveries fell by 16.2 percent from the same month last year to 1.29MT from nations such as Malaysia and Indonesia, Papua New Guinea and Brunei. The still small US volumes were slowly growing and came to 467,000 tonnes, a surge of 155 percent from a low base, though lower for then the Russian delivery volumes. Shipments from Russia, mostly from the Sakhalin Island plant in the Far East, amounted to 588,000 tonnes in November, an increase of 18.7 percent year-on-year. Japan will be importing more cargoes in the years ahead from booked volumes and spot cargoes with five US export plants now in operation. The balance of imports came from Australia, African nations and the spot market amounted to 2.74MT, little changed from the previous month but slightly less than the 2.80MT posted in November 2018. Most of the cargoes came from Australian plants such as Wheatstone and Woodside's facilities in Western Australia and Darwin and Bladin Point in the Northern Territory.

MCDERMOTT International and Japanese firm Chiyoda said they continued to make strides towards substantial completion of Train 2 at the Cameron LNG plant in Hackberry in Louisiana. McDermott and its joint venture partner, Chiyoda, said the Cameron liquefaction plant on the Calcasieu Ship Channel had begun producing LNG. The same companies have also been working on the Freeport export plant at Quintana Island in Texas. "While production is in the initial phases, this significant project accomplishment is a precursor to substantial completion of Train 2," said McDermott of the Cameron project. "This accomplishment is attributable to the entire team's unwavering commitment to project delivery and steadfast focus on safety and quality performance as we work towards completion of Train 2," said Mark Coscio, McDermott's Senior Vice President for North, Central and South America.

"We are confident their hard work and focus will continue through the remainder of the project," stated Coscio. McDermott and Chiyoda have provided the engineering, procurement and construction for the Cameron LNG project since the project's initial award in 2014. The project includes three liquefaction Trains with a projected export of 12 million tonnes per annum of LNG, or about 1.7 billion cubic feet per

day. Cameron LNG is jointly owned by affiliates of Semptra Energy, French major Total, Japan's Mitsui & Co. and Japan LNG Investment, a company jointly held by Mitsubishi Corp. and shipping line Nippon Yusen Kabushiki Kaisha.

MITSUMI Osk Lines and French energy major Total have signed a long-term charter contract for a second large LNG bunkering vessel to be delivered from China in 2021 and deployed in the Mediterranean. Total said the new bunkering ship would conduct its operations in the South of France, around the Marseille-Fos LNG delivery and port area. This bunker vessel will be built by Hudong-Zhonghua Shipbuilding in Shanghai, China. "She will have a capacity of 18,600 cubic metres for a length of about 135 metres and will be fitted with the Mark III membrane containment system provided by French company GTT," said Total. The company said the bunkering vessel's construction is in line with the International Maritime Organization decision to drastically limit the sulfur content of marine fuels as of 2020. "In this context, the transition from heavy fuel oil to LNG is a competitive, efficient and immediately available solution for maritime transportation," said Total.

Used as a marine fuel, LNG sharply reduces emissions from ships, resulting in a significant improvement in air quality, particularly for communities in coastal areas and port cities. "This vessel has been specifically designed to supply LNG bunker in the Mediterranean area to a wide range of vessels, including containerships, tankers, ferries and large cruise ships," explained Total. "She will meet the highest technical and environmental standards, herself suing LNG as propulsion fuel and integrating a complete re-liquefaction of the boil-off gas," stated the French company. The newbuild vessel will be operated under the French flag by MOL, jointly with Gazocean, the French company based in Marseille and one of the most experienced in LNG carrier transportation. "We are proud to launch with MOL the first large LNG bunkering vessel in France," said Jérôme Leprince-Ringuet, Managing Director of Total Marine Fuels. "LNG is the best available alternative to reduce the environmental footprint of shipping, as it significantly improves air quality and strongly contributes to reducing greenhouse gases," added Leprince-Ringuet.

The first Total-MOL LNG bunkering vessel was launched in Shanghai in November 2019 and will be delivered in 2020, operating from Rotterdam in the Netherlands and other Northern European ports. It will supply LNG to commercial vessels, including 300,000 tonnes per annum to the French container line CMA CGM and its nine ultra-large newbuild containerships which will operate on the Europe-Asia trade route. Kenta Matsuzaka, MOL Managing Executive Officer, said his company was honoured to be chosen by Total as its partner for the second LNG bunkering newbuild. "We believe this project will further solidify our relationship," said Matsuzaka. "In recent years, the role of LNG has changed enormously. LNG of course, serves as a clean energy source, and we expect to see wider use for it as a vessel fuel, so we anticipate significant growth in the future," stated the Japanese executive.

PAVILION Energy of Singapore and the fuels subsidiary of French major Total have signed a 10-year, fully-termed agreement to jointly develop an LNG bunkering supply chain in the Port of Singapore. Pavilion, a subsidiary of Singaporean wealth fund Temasek, and Total Marine Fuels Global Solutions (TMFGS) signed the final deal to follow on from the Heads of Agreement signed by the two companies in June 2018. The cooperation includes the shared long-term use of a 12,000 cubic metres capacity LNG bunkering vessel newbuild that will allow each party to supply LNG to their respective customers. "Pavilion Energy is fully committed to leading the maritime industry's energy transition with LNG as a marine fuel - beginning in Singapore, our home base," said Frédéric H. Barnaud, Group Chief Executive of Pavilion Energy. "We are very pleased to be working with our strategic partners such as Total, to jointly develop robust LNG bunker logistics and supplies that are readily available for customers in Singapore and beyond," added Barnaud.

Jerome Leprince-Ringuet, Managing Director of Total's TMFGS, also praised the agreement. "We are very proud that the cooperation between Pavilion Energy and Total is paving the way towards the development of LNG as a marine fuel, especially in Singapore, the largest bunkering hub in the world," explained Leprince-Ringuet. "With this agreement, we pursue our ambition to build a comprehensive network of supply for this

clean marine fuel," he added. "It also underscores our commitment to offer our customers the best available and technologically proven solution to significantly reduce the environmental footprint of maritime transport," stated the Total executive. Pavilion said it had taken several firm steps to invest in and support Singapore's LNG bunker readiness for 2020, when a cap on sulphur in fuel comes into force, and beyond. It performed Singapore's first commercial ship-to-ship LNG bunkering operation in May 2019, comprising a reload of 2,000 cubic metres of LNG from a small-scale tanker to a receiving heavy-lift commercial vessel. Pavilion also chartered its first LNG bunkering vessel newbuild from Mitsui OSK Lines in February 2019, with the vessel currently undergoing construction at Sembcorp Marine's Tuas Boulevard Yard in Singapore.

QATAR Petroleum and German utility Uniper are in firm talks on the supply of LNG by Qatargas to the proposed import terminal at the North Sea port of Wilhemshaven in the state of Lower Saxony. The Minister President of Lower Saxony, Stephan Weill, confirmed the advanced state of talks as head of a trade delegate visiting the Qatari capital Doha. "So far, negotiations (between Qatar and Uniper) are at a very deep and concrete stage," said Weil, who was leading a delegation of 40 German companies in talks in Qatar. "We are going out of nuclear power and we're getting out of coal power," said Weil. "But we are also going into renewable energies and in relation to that, I see a lot of interesting perspective especially for liquid gas," he added. The Uniper utility itself is based in Duesseldorf in the state of North Rhine North Rhine-Westphalia. Uniper said recently that the Wilhelmshaven FLNG terminal is expected to start up by 2023, just after another LNG project, the rival Brunsbuettel venture proposed for the Elbe River near the port of Hamburg.

Uniper already trades LNG like most European utilities and describes itself as the facilitator of the Wilhelmshaven regasification project. The Wilhelmshaven FLNG venture will have capacity of around 7.5 MTPA and Uniper has said various possible partners are interested in booking capacity as well as buying shares in the German import project. The German utility has already lined up LNG supplies from Pieridae Energy, the developer of the Goldboro project in the Canadian Atlantic province of Nova

Scotia. Uniper has a 20-year supply agreement and a final investment decision on the Canadian plant is scheduled by September 2020. Calgary-based Pieridae is seeking to build a liquefaction plant with an initial two Trains northeast of the Nova Scotia capital, Halifax. The 20-year agreement with Uniper is for 5 million tonnes per annum of LNG, half of the Canadian plant's expected first phase capacity. The rival to Uniper's North Sea LNG terminal, the onshore Brunsbuettel facility on the banks of the Elbe River, is already at the engineering stage and reaches an important deadline this week. It is being developed by a company called German LNG Terminal and made up of European companies. The Brunsbuettel project is a joint venture involving two Dutch companies, natural gas operator Gasunie, global storage company Vopak as well as German energy firm Oiltanking GmbH, a subsidiary of Marquard & Bahls AG of Hamburg. The Brunsbuettel developers have chosen four groups to compete for the engineering, procurement and construction contract. This follows a pre-qualification process that ran from June to September 2019. German LNG's EPC tender closing is on 5th December 2019 with the subsequent EPC contract award planned before the end of April 2020.

The shortlisted companies and consortia to build Brunsbuettel are: Spanish bidders Cobra Instalaciones y Servicios SA and Sener Ingeniería y Sistemas; South Korea's Hyundai Engineering Co. and Korea Gas Corp; a French-led consortium comprising Sacyr Fluor SA, Entrepouse Contracting, VINCI Construction Grands Projets and Sacyr Somague SA; and a Spanish-German bid from Tecnicas Reunidas SA and Heitkamp GmbH. The EPC scope contains a jetty with two berths for LNG carriers ranging from 1,000 up to 265,000 cubic metres capacity, both with LNG unloading and loading capabilities, LNG storage tanks, LNG vaporization and distribution facilities for a total capacity up to 6 MTPA.

SANTOS, the Australia-Pacific LNG project shareholder, said it was set to advance with production expansion, including using the Barossa feed-gas field for Darwin LNG and investment in the construction of additional Trains for the Papua New Guinea export plant. Santos said it was lifting its 2025 production target further to 120 million barrels of oil

equivalent, more than double last year's figure. "The new target, up from 100 mmbbl set in 2018, represents a cumulative annual growth rate in production of over 8 percent to 2025," said the company. Santos gave the update at the company's Investor Day event in Sydney addressed by Santos Chief Executive Kevin Gallagher. "Our strategy has been to establish a disciplined low-cost operating model that delivers strong cash flows through the oil price cycle," stated the CEO. "Our 2019 forecast free cash flow breakeven oil price is now US\$29 per barrel," he explained.

"The recently announced acquisition of the ConocoPhillips interests in northern Australia and Timor-Leste will further reduce our breakeven oil price and deliver operating interests in long-life, low-cost conventional natural gas assets and strategic LNG infrastructure," added Gallagher. "We are now positioned for disciplined growth leveraging existing infrastructure in all five of our core assets," he said. The Barossa LNG project for the Darwin plant purchased from ConocoPhillips has a final investment decision scheduled for the first quarter of 2020. Santos said PNG LNG expansion was still heading for a start in front-end engineering and design in 2020. The Dorado liquids project is targeting engineering studies to start by the second quarter of 2020. The Santos discoveries in the Dorado field offshore Western Australia opened a new basin.

The Dorado-2 well is located in petroleum permit WA-437-P, about 160 kilometres north of Port Hedland and two kilometres away from the Dorado-1 discovery made in July 2018. Santos has an 80 percent share in the permit and Carnarvon Petroleum owns 20 percent. Adelaide-based Santos is also the operator of the Gladstone LNG export plant on Curtis Island in Queensland. Santos said the coal-seam-gas-to-LNG facility would be ramped up to provide 6.2 million tonnes per annum of sales from 2020. The company is also aiming for production growth in its Cooper Basin assets in central Australia. Gallagher said Santos was well positioned to fund growth out of operating cash flow and debt while maintaining borrowing levels within the company's target range. "Natural gas is forecast to supply a quarter of the world's total energy demand by 2040. Through our Energy Solutions business, we are investing in projects to lower emissions and assessing the significant potential for carbon capture and storage in the Cooper

Basin," said Gallagher. Completion of the ConocoPhillips acquisition is expected in the first quarter of 2020, subject to third-party consents and regulatory approvals. Santos said that on completion of the assets acquisition from ConocoPhillips, with the expected 25 percent sell-down to SK E&S of South Korea assumed, the stake held by Santos in the Bayu-Undan gas field and Darwin LNG assets would be 43.4 percent.

SOUTH KOREA has approved a draft law for the nation to be at the forefront of developing eco-friendly ships powered by clean fuel such as LNG at its world-leading shipyards. "The Eco-Friendly Ship Act will systematically manage to reduce air pollutants such as greenhouse gases and fine dust in Korean ports and strengthen our competitiveness in shipbuilding and the shipping industries," stated the Trade Ministry. The Ministry said it would roll out a set of measures to speed up the development and supply of such ships using clean fuels like LNG, methanol and hydrogen. "A legal basis has been laid for the development and expansion of eco-friendly ships," said the Ministry's statement. "The government passed the enactment of the Enforcement Decree of the Eco-Friendly Vessel Act at the cabinet meeting on the 17th of December," it added. "This Decree contains the mandate and the contents necessary for implementation of the Eco-Friendly Vessel Act, which is to be implemented on January 1," it stated. "In detail, the environmentally friendly ship conversion policy currently concentrated on foreign cargo ships has been expanded to various ships such as domestic trading, passenger and fishing vessels and others, so that the effect of converting into eco-friendly ships can be increased," explained the Ministry.

In addition, the government, local municipalities, public institutions and local public corporations were required to purchase all vessels with clean fuel capability when the Eco-Friendly Ship Act comes into force. As a first step, the country will gradually replace 140 state-owned ships with those utilizing clean energy sources by 2030. For the ships whose lifespans are beyond 2030, South Korea plans to install new equipment, such as diesel particulate filters, to reduce pollutant emissions. The latest efforts also came amid tightened international regulations on the amount of sulfur content in marine fuel starting in January. The International Maritime

Organization rule will go into effect limiting the sulfur cap of marine fuel to 0.5 percent from the current 3.5 percent. To comply with the IMO regulations, vessel operators need to either install exhaust-cleaning systems, called scrubbers, or use clean fuels, such as low-sulfur fuel oil, marine gas oil or LNG.

TC ENERGY, the Canada-based pipeline company, has asked US regulators to increase delivery capacity on its North Baja Pipeline to the US-Mexican border to serve the Costa Azul LNG export venture on the Pacific Coast of Mexico. The Costa Azul facility is an import terminal being transformed into an LNG export plant by California utility Sempra Energy, the owner of the Cameron LNG export facility in Louisiana as well as the Port Arthur export project in Texas. TC Energy has filed with the US Federal Energy Regulatory Commission to alter its North Baja XPress pipeline project to help send additional feed-gas to the proposed Costa Azul plant. It is seeking to install more compression at an existing compressor station in La Paz County, Arizona, and to modify meter stations in La Paz as well as in Imperial County in California. The North Baja, owned by TC Pipelines, operates a bi-directional pipeline from Ehrenberg in Arizona to the international border between Yuma, Arizona, and North Baja in Mexico. There the TC Energy pipeline connects with a pipeline owned by Sempra Energy's Mexican subsidiary, IEnova.

The IEnova's Gasoducto Rosarito pipeline serves demand in the north Mexican state of Baja California and in Imperial and San Diego counties in California. When Costa Azul operated as a regasification terminal from 2008 it was the first import terminal on the West Coast of North America. Subsequent pipeline modifications allowed south-to-north flows when there was demand for imported gas in California. However, LNG imports ended with the shale-gas boom and north-to-south flows now predominate on the North Baja pipeline. Sempra unit IEnova has made progress in developing the Costa Azul LNG export project, located about 15 miles north of the Mexican town of Ensenada. Costa Azul will have liquefaction capability constructed in two phases. The first part of the transformation of the plant will see the building of a single liquefaction Train to be located adjacent to the existing terminal and with capacity for 2.4 MTPA of exports. Sempra has already found

three initial buyers who have booked the full export capacity of the first phase.

They are French energy major Total, Japanese trading house Mitsui & Co. and Tokyo Gas. The Costa Azul plant's liquefaction capacity would then be increased with a second phase of development. IEnova said in November 2019 that it was still settling the project's engineering, procurement and construction bidding process, its offtake contracting as well as some regulatory permits. "We continue to advance on all three fronts," stated IEnova Chief Executive Tania Ortiz Mena. Semptra received authorizations in April 2019 from the US Department of Energy to export US-produced pipeline natural gas to Mexico and to re-export it as LNG to countries that do not have a free-trade agreement with the US.

TC ENERGY has filed an application with the Canada Energy Regulator (CRE) for approval of a six-year negotiated and unanimously supported agreement with its customers and other interested parties on Canadian Mainline tolls. TC Energy's TransCanada Pipelines subsidiary has requested timely approval of the unanimous settlement to ensure certainty before terms come into effect in January 2021. The Canadian Mainline is comprised of around 14,100 kilometres (8,761 miles) of pipeline and associated facilities and primarily transports Western Canadian Sedimentary Basin (WCSB) natural gas for delivery across the Prairie provinces and to markets in Eastern Canada and the US. In addition to securing pipeline market entry for natural gas resources in Canada and the US, TC Energy is also involved in projects to transport LNG feed-gas in the Canadian province of British Columbia and on the US Gulf Coast, as well as down to Mexico. "This (tolls) settlement is the product of a comprehensive collaborative process of engagement and negotiation with our Canadian Mainline customers," said Russ Girling, TC Energy's President and Chief Executive. "It enhances competitiveness and provides toll certainty for our customers while maintaining stable revenue for TC Energy," added the CEO. "The settlement highlights the continued importance of the Canadian Mainline and we appreciate the efforts of industry to work with us to create innovative solutions that utilize this critical transportation link to enhance the long-term success of the WCSB," stated Girling.

The settlement is designed to facilitate cost-effective transportation of natural gas from the WCSB. The agreement has five main parts. 1) It encompasses a six-year term from January 2021 through December 2026; 2) It sets an equity return of 10.1 percent on 40 percent deemed common equity, subject to variance and depending on actual operating costs and natural gas throughput; 3) The agreement sets tolls for the term for separate segments of the Canadian Mainline, including a 20 percent reduction from existing tolls on the western portion of the system that includes the path from Empress to Emerson; 4) It includes a sharing mechanism incentivising TC Energy to achieve cost efficiencies and increased revenues, and finally; 5) The deal affirms TC Energy's pricing flexibility and allows new market-driven services to enhance flexibility to respond to changing market conditions.

US regulators have carried out a construction inspection of the small-scale LNG liquefaction project in Providence, Rhode Island, being built under an expansion permit by the US subsidiary of UK company, National Grid plc. The US Federal Energy Regulatory Commission first carried out an environmental assessment for the Fields Point liquefaction project in June 2018 covering the existing storage facility at Providence now being extended within its existing boundaries. The project is being developed by National Grid, a company active in natural gas pipeline and supply operations in the US Northeast and which also operates the UK gas grid and the Isle of Grain LNG import terminal near London. The small-scale liquefaction Train, including heat exchangers cooled by a closed-loop nitrogen refrigeration cycle, is part of an improvement project for an existing peak-shaving facility to guarantee supplies in Providence during peak winter demand periods. "LNG is crucial to meeting the demand for gas on the coldest winter days," the UK-based company has said.

National Grid noted that Fields Point facility has been located at the current site in Providence to provide safe and reliable service to customers for over 40 years. FERC said the purposes of the latest inspection by two officials was to verify that construction activities were consistent with FERC's authorizations and to confirm that National Grid is complying with the environmental and engineering conditions attached to the



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permit issued in October 2018. The LNG will be stored in the existing and operational 600,000 barrels (2 billion cubic feet of natural gas) capacity LNG storage facility at Fields Point near the Providence River. The completed facility will provide LNG storage, vaporization and redelivery services to customers. National Grid is also adding a 20 million standard cubic feet per day gas pretreatment and liquefaction system. The facilities will be located within the boundaries of its existing Fields Point site with no alteration of the existing LNG storage tank or the location of the existing cryogenic piping and vaporization equipment. Feed gas for the proposed liquefaction facilities will be delivered via Narragansett Electric's existing 12-inch diameter pipeline. "Environmental controls were maintained and functioning properly," said the FERC inspectors in their report. "Construction activities observed were within approved workspace limits and were in compliance with the designs and plans filed and approved by FERC. The next inspection will be performed within 12 weeks," it added.

WOODSIDE Petroleum, the Australian liquefied natural gas operator Woodside said it had submitted its plans for the Sangomar Field Development project offshore Senegal, the West African nation also participating in separate

floating LNG projects led by BP of the UK. "The Development and Exploitation Plan and exploitation authorization request are the last major regulatory submissions required before the final investment decisions can be made by each joint venture participant," said Woodside. Woodside, operator of the North West Shelf and Pluto LNG plants in Western Australia, acquired the Sangomar stake in the highly prospective Atlantic Margin region from US major ConocoPhillips in 2016. The blocks, located southwest of the Senegalese capital Dakar, include the SNE discovery, now renamed Sangomar, which offers near-term oil production and a foundation for creating an energy hub.

The Phase 1 development is expected to include up to 26 oil production and gas and water injection wells. Natural gas is expected to be transported to shore. Woodside CEO Peter Coleman said the submission demonstrated the Australian company's commitment to meeting the permit conditions and progressing the development of the Sangomar field. "The submission of the Exploitation Plan and authorization request is the culmination of front-end engineering design activities," said Coleman. "These are the final documents required by the Government ahead of granting approval to proceed," he added. "We look forward to continuing to work with the joint venture, the Government, our contractors and other stakeholders to develop this opportunity, which will also be Senegal's first oil project," he said.

The Director General of the Senegal National Oil Company (Petrosen), Mamadou Faye, said he was pleased with the progress. "The Exploitation Plan outlines how the field will be developed to the benefit of the people of Senegal and the joint venture, and we are excited about being in a position to take a final investment decision," added Faye. Petrosen is also part of separate joint ventures in Senegalese waters with BP of the UK, Kosmos Energy of the US and West African neighbour Mauritania in developing several floating LNG projects. The Sangomar Field Development Phase 1 concept is a stand-alone floating production storage and offloading (FPSO) facility with 23 subsea wells and supporting subsea infrastructure. The FPSO is expected to have a capacity of around 100,000 barrels per day, with first oil targeted in early 2023. The Sangomar Field Development joint venture comprises Woodside, UK-listed Cairn Energy, Petrosen and FAR Ltd of Australia.

WOODSIDE said that its A-6 Development offshore Myanmar in southeast Asia has now moved from exploration and appraisal to the pre-front-end engineering design phase. The Woodside natural gas project in Myanmar envisages a new 240-kilometres offshore pipeline to connect with existing links to the Myanmar capital Rangoon and another to Thailand. The new Myanmar pipeline supplies will complete with Thai LNG imports. The Myanmar development concept is for six wells in phase one in 2,300 metres water depth and a further four wells in phase two connected to the offshore Yadana platform complex. The Block A-6 development within Woodside's Southern Hub is being progressed alongside joint venture participants MPRL Exploration and Production of Myanmar and France's Total E&P.

Woodside, together with the Block A-6 joint venture partners and Myanmar Oil & Gas Enterprise (MOGE), has also successfully executed two agreements comprising the fourth amendment and a supplementary agreement to the Production Sharing Contract and Upstream and Midstream ratios. "In enabling the A-6 Development to move forward, the Government has demonstrated that it is open for business, commercially-minded and disciplined in its approach to attracting investment," said Woodside. Woodside Executive Vice President Development Meg O'Neill thanked the Government of Myanmar for its ongoing support. "We appreciate the Government of Myanmar's ongoing support and willingness to work with the joint venture to ensure the A-6 Development is progressed in a timely manner," said O'Neill.

"The Block A-6 Joint Venture and the Government of Myanmar have agreed a fiscal framework that will enable commercialisation of Myanmar's first ultra-deep-water resource," she explained.

The Woodside project will generate a significant long-term revenue stream for the country and provide taxes and royalties to the Government. "We are also proud that this development has been structured to benefit the people of Myanmar through training, development and capability build for Myanmar nationals," O'Neill added. The A-6 Development is targeting FEED entry in the second half of 2020.

WOODSIDE has signed a firm supply agreement with Uniper Global Commodities, a unit of the Germany

utility Uniper. The Woodside-Uniper sale and purchase agreement (SPA) follows on from the accord initialled at the Gastech conference in Houston in September 2019. The Australian company said its subsidiary, Woodside Energy Trading Singapore, signed the SPA to supply Uniper with LNG from Woodside's portfolio for a period of 13 years starting in 2021. "The quantity of LNG to be supplied under the SPA will initially be up to 0.5 million tonnes per annum, increasing to approximately 1 MTPA from 2025," said Woodside. "Supply from 2025 is conditional upon a final investment decision on the Scarborough development," added Woodside.

Woodside's main new project is the Scarborough gas and LNG development in Western Australia, including building a second liquefaction Train at the Pluto plant on the Burrup Peninsula. The Uniper volumes from Woodside will be part of the utility's Asian trading portfolio. Uniper, whose headquarters are in Duesseldorf, has an LNG supply agreement with a Canadian project and is involved in a German import terminal venture at Wilhelmshaven. The floating import terminal on the North Sea Coast is scheduled to be online slightly behind the rival Brunsbuettel facility proposed for the Elbe River near the port of Hamburg. Uniper Chief Financial Officer Sascha Bibert said during a presentation of nine-month financial results in November 2019 that there was good demand for the gas and interest from LNG buyers in Germany for the FLNG facility set to be online by 2023. The Germany utility has also lined up LNG supplies from Pieridae Energy, the developer of the Goldboro LNG project in the Canadian Atlantic province of Nova Scotia. Uniper has a 20-year supply agreement and a final investment decision on the Canadian plant is scheduled by September 2020. Calgary-based Pieridae is seeking to build a liquefaction plant with an initial two Trains northeast of the Nova Scotia capital, Halifax. The 20-year agreement with Uniper is for 5 million tonnes per annum of LNG, half of the plant's expected first phase capacity. Uniper already trades LNG like most European utilities and describes itself as the facilitator of the Wilhelmshaven regasification project. The North Sea FLNG venture will have capacity of around 7.5MTPA and CFO Bibert said that various possible partners are interested in booking capacity as well as buying shares in the German import project. ■

Diary of events

January 2020

European Gas Conference 2020

27 - 29 January 2020
Vienna Marriott Hotel, Parkring 12A,
1010 Vienna, Austria
<https://eurogas.org/>

8th Annual Global LNG Bunkering Summit 2020

28 - 30 January 2020
Postillion Convention Centre
Paul van Vlissingenstraat 8,
Amsterdam 1096, Netherlands
<https://www.oilandgasiq.com>

February 2020

International Gas Union (IGU) Research Conference For Gas Innovations

24 - 26 February 2020
Oman Convention & Exhibition
Centre, Muscat,
Sultanate of Oman
<https://www.igrc2020.com>

March 2020

6th International LNG Congress

2 - 3 March 2020
Tangla Hotel Brussels.
Avenue Emmanuel Mounier 5,
Woluwe St Lambert, Brussels 1200
Belgium
<https://lngcongress.com>

Eastward movement of gas prices means the transition of LNG disputes from Europe to Asia

Analysis from London-based international law firm Squire Patton Boggs LLP

LNG pricing mechanisms in Western Europe have become more stable in recent years. This is largely due to the increased presence and use of gas-on-gas pricing hubs.

Over the last several years, attention has rightly turned to the Asia Pacific market. The continuing expansion of economies, the increase in demand for energy, and a fluctuation in oil prices, have put intermittent pressure on sellers in the region.

Reviews

When considering how the next wave of gas and LNG price reviews are originating, and in what form, those who have studied the gas markets over many years would argue that the future market landscape will likely be shaped by similar events to what has gone before.

Traditionally, factors such as market liberalisation, increased competition, market interconnectivity, supply and demand imbalances, financial downturns and political and environmental changes have all played important roles in the rapid evolution of national gas markets.

Take, for example, the Western European gas markets, where the combination of these factors over time contributed to the development of a mature and price transparent market place in some - but not all - of these national markets.

The question is: to what extent will similar emerging factors pave the way for making the Asia Pacific market the new home for LNG price review disputes?

Market evolution

The status of the Asia Pacific LNG markets have lagged behind many European markets. As Stephen Anway and George von Mehren observe: "The Asian markets today are where European markets were two decades ago: relatively immature markets in transition, where pricing is still largely tied to oil products."^[1] The main reasons for this are twofold. First, there has been minimal gas-on-gas pricing, as competition between suppliers of gas has been very slow to evolve. Secondly, an Asian gas-on-gas pricing hub is yet to be developed.

Steps towards liberalisation to open up

the markets have not caught on in the Asia Pacific region. The countries that make up the Asia Pacific region have their own political and geographical differences.

The same initially applied with the liberalisation legislation in Western Europe. Even with a common rulebook laid down by the European Union from 1998 to 2009,^[2] certain markets, such as Italy, exhibited a slower move towards market liberalisation.

This led to its gas hub initially developing at a slower rate compared to those in other Western European territories, such as the United Kingdom^[3] and the Netherlands.

The same is true for those European Union member states that are not well interconnected such as Spain, Portugal, Sweden, Malta, as well as many of the EU Member States in Eastern Europe.

Liberalisation

It is no surprise that development towards liberalisation is more patchy in the Asia Pacific region than it is within the EU member states: in contrast to the EU member states, no two Asia Pacific territories are playing to the same standardised directives and rules.

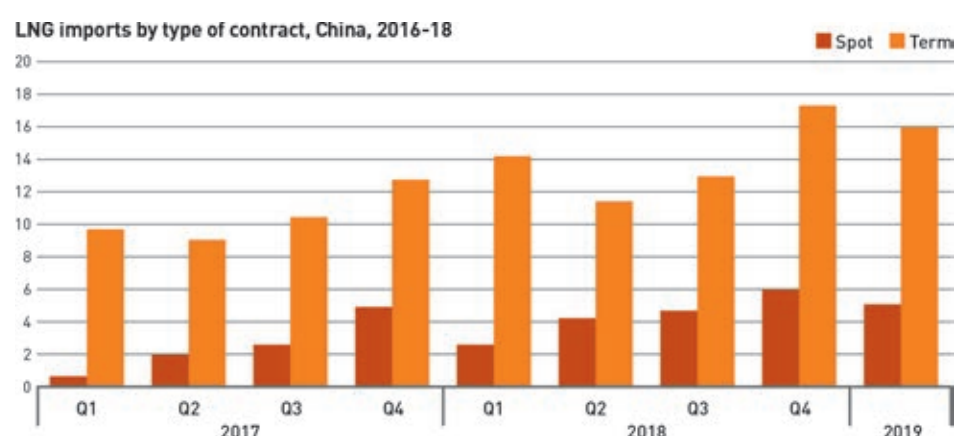
Unlike the efforts of the EU, there is an absence of a single legal and regulatory body to coordinate the necessary rules governing infrastructure access, integration, entry-exit and to regulate anticompetitive conduct.

Over and above this, for further market competition to occur, there would need to be a concerted effort across the Asia Pacific region to liberalise their markets, which would take time.

Whilst the growing market is well placed to generate the necessary trade and liquidity in the market, limited market participants leave buyers without the freedom to choose their suppliers. The speed and degree which incumbents will be compelled to share in the spoils of a more competitive marketplace will be different from territory to territory.

Oil-indexed

Minimal liberalisation and reduced competition also help to explain why oil-indexed contracts (including LNG and



Example of the different contract volumes shipped to China by exporters

pipeline gas) account for 60 per cent of imports in Asia, compared to the global average of 19.5 per cent.^[4]

However, oil-indexation is not fully explained by this lack of competition. Rather, as the Asia Pacific region remains in an alternative fuel displacement world, it follows that oil indexation generally works when trying to displace oil products.

Of course, with full downstream liberalisation expected in the future (at some point), there may be sufficient gas-to-gas competition that gas prices really start to drive the price signal.

Looking towards and past an Asia Pacific Hub Price: While the lag in market maturity remains, there are signs that changes are occurring and momentum is building in the Asia Pacific region. Various forms of competition exist in the Asia Pacific region - albeit these are different to those in Western Europe.

China, while not a fully liberalized market per se, benefits from competing sources of gas in the form of: (i) existing long-term contracts; (ii) the spot market; and (iii) pipe gas, all of which contribute to shaping and driving price signals.

The rapid development of regional economies has been matched by a boom in energy consumption, in particular gas. Japan, Korea, Taiwan, China and India make up more than 68 percent of global LNG demand,^[5] with China recognised as by far the prime contributor to future consumption, backed by its dash for gas to replace coal for environmental reasons.

This expansion appears unstoppable: even if overall consumption were to fluctuate with economic ups and downs, the transition from coal to gas shows no signs of slowing.

Consumption

In any event, looking at the region more widely, its share of global energy consumption is predicted to rise yet further, to 49 per cent, in the next 20 years.^[6]

The Asia Pacific region's growth is not set to slow down. Over half of growth between 2017 and 2018 came from China, with continuing increased demand linked to its multi-billion Belt and Road initiative alongside other industrial and infrastructure developments.^[7]

When modelled with low demand, China's consumption from oil-indexed contracts exceeds predicted supply until 2028.

A similar story emerges from Japan, although there pricing indexed to European hubs or the Henry Hub is likely to dominate surplus supplies until the late 2020's.^[8]

In recognition of this projected growth, China is establishing third party access to LNG terminals.^[9] In 2015, new policies were announced to prepare for a market opening due to occur by 2020, in advance of which unbundling rules are taking effect for both electricity and gas.

Changes

The Japanese government is taking the conscious effort needed after the Fukushima incident in 2011: releasing a strategy to combat LNG market issues in 2016,^[10] increasing large-scale storage facilities and granting external access to a receiving terminal.^[11]

Japan began the gradual process of slowly opening up its electricity markets in 2016.^[12] It opened up its gas markets in 2017. This sudden increase in competition

has led to a loss of customers by the former monopolies, as new entrants arrive to supply the Japanese electricity market.

Japan has also relaxed the use of destination clauses in contracts, increasing liquidity. In turn, South Korea has published a policy change to its long-term energy consumption.^[13]

LNG pricing in the Asia Pacific region can now be undertaken based on price assessments by a number of aggregators that report price estimates.

These are not based on actual landed prices, and so are subject to some criticism as to their reliability, but they all represent significant developments towards an Asia Pacific hub price.

As reported by the Energy Contract Company, the following LNG price signals are already present in the Asia Pacific region:

1. “The ICIS publication ‘Global LNG Markets’ publishes a weekly assessment of the price of Spot Cargoes delivered to Far East markets, India, and to Japan for each of the following two months.
2. Platts publishes a “JKM” price for LNG delivered to Japan and Korea. This is published monthly and covers deliveries to Japan and Korea in month M and is assessed between the middle of month M-2 and the middle of month M-1. The JKM prices are also published on line on the CME. The CME also shows monthly LNG prices for the following two years. This could be the beginning of a forward market in LNG.
3. Argus also publishes daily prices of the spot prices of LNG delivered to North East Asia, China and India for each of the following three half month periods. These are also done on a price assessment basis.
4. There have also been attempts to set

up an LNG price index based in Singapore.”^[14]

Any hub, whether proposed by Singapore, China or Japan, must first overcome its own difficulties and it is unclear who will be first past the post. All of the contenders will take time to develop and to be fully implemented.

Complicated

Until then, fixing Asia Pacific contracts to US or Western European hubs is not a straightforward exercise.

Local market conditions, such as the boom of shale gas in the United States, the European financial crash and the Fukushima disaster, demonstrate the risk in indexing to a hub located thousands of miles away.

Such indexation can result in as much of a differential as oil-indexed pricing and is also susceptible to FX risk, in addition to the usual market uncertainty.

Spot prices are a function of supply and demand. At any given time spot prices based on competitive hub prices will be different from prices under oil-based contracts.

In recent years, the global oversupply of LNG has resulted in spot prices often sitting below long-term prices.

The comparison provided by spot cargoes, can increase the likelihood of traditional oil-indexed pricing clauses being challenged, particularly when contracts are lengthy and have a long time left to run.

Comparisons

However, it bears repeating that spot prices do not always provide a comparable price marker, capable of being relied on automatically in any price review under long-term contracts.

It is likely that the spot price will first need to reflect enough liquidity and

demand that it becomes the driving price signal in the market. This is the dynamic we saw in Western Europe where the distinction between “spot prices” and “hub prices” disappeared - the hub price became the driving price signal for all gas in the market, in respect of both spot and long-term markets.

If spot cargoes provide buyers with a more reactive price, the premium for security of supply under long-term contracts looks less appealing.

This may, over time, cause conditions similar to those seen in Western Europe in the early “noughties”, when surplus supply from the US shale gas boom, coupled with decreased demand due to the 2008 financial crisis, caused financial hardship to those holding traditional oil-indexed contracts, forcing them to either renegotiate or arbitrate.

Will price review arbitrations follow?

Once a hub starts to gain maturity, the likelihood that its price signal is used to re-open and re-align remaining oil-indexed pricing mechanisms increases. Once this occurs, the number of remaining long-term oil-indexed contracts, high demand, an active spot cargo market coupled with market uncertainty will increase the probability of price review arbitrations in the Asia Pacific region.^[15]

One might therefore suspect that price review negotiations and arbitrations are likely to follow in the Asia Pacific region, in order to recalibrate contract prices to current market economics, as above.

Is this possible without the presence of an Asia Pacific hub? The reality we are now seeing suggests this is the case. Price reviews and negotiations are increasing in the Asia Pacific region.

This is consistent with the Western European story. Lest we forget, it was

liberalisation that created gas-to-gas competition in Western Europe, which in turn impacted price levels, irrespective of price indexation.

Likewise, future liberalisation, creating gas-to-gas competition in the Asia Pacific region, impacting price levels, will likely play a role in this process.

Negotiations

An Asia Pacific hub, however far off it may (or may not) be, would then increase the number of price review negotiations, at least for several years, as the long-term oil-priced contracts remain in place and subject to re-opener.

Whilst price negotiations have started and continue to be likely, the litmus test as to whether Asia Pacific players will be prepared to progress their disputes to arbitration if negotiations fail.

The recent shift in attitude by Chinese state-owned companies, Korean and Japanese buyers in favour of invoking dispute resolution mechanisms may provide some clues.

Whilst still favouring renegotiation if possible, there is less of a reluctance to invoke formal dispute resolution procedures now than was the case before.

What is less clear is how long this wave of price reviews will last. Any Asia Pacific hub, once formed, will take time to mature.

Price-review arbitrations continued in Western Europe for at least a decade after the maturity of the Western European hubs. Many oil-indexed contracts run for 20 or more years.

It may only be on the maturity of gas-on-gas pricing, and the end of these contracts, that price reviews will reduce in number. ■

The articles was written by Max Rockall and Ben Holland of London-based international law firm Squire Patton Boggs LLP.

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Alfa Laval Aalborg boiler technology offers an easier and safe path to LNG propulsion

Company's Gas Combustion Unit (GCU) and services form a complete portfolio for boil-off gas safety

Alfa Laval is not an engine maker, but is nonetheless playing a key role in the move towards LNG propulsion.

Alfa Laval technologies and expertise - especially in the area of boilers - are enabling marine vessels to deal with boil-off gas (BOG), which is the critical step in making the shift to LNG.

Portfolio

Alfa Laval's dual-fuel boilers, Gas Combustion Unit (GCU) and services form a complete portfolio of solutions for BOG safety.

LNG is on the upswing, due to its role in reducing emissions and its relative economy compared to today's low-sulphur fuels. "Customers are attracted to LNG propulsion for a variety of reasons, and it's being considered for many vessel types besides LNG carriers," said Markus Tauriainen, Manager Exhaust & Combustion System Sales at Alfa Laval.

In order to use LNG as fuel, vessels must be able to manage boil-off gas (BOG), the

International code for Gas as Cargo (IGC).

When it comes to using LNG for propulsion under the International code for Gas as Fuel (IGF), Alfa Laval is also managing BOG with dual-fuel Alfa Laval Aalborg boilers - and is tipping the balance in LNG's favour for a far larger number of vessels.

A compact and simple way of managing boil-off gas: When an LNG fuel tank is incorporated into a vessel, the pressure created by BOG must be kept to a level that avoids ventilation to atmosphere via the safety valve.

Complexity

The reliquefaction of the gas is possible, but doing this on board adds too much complexity and more costs for most vessels.

Likewise, burning the gas in auxiliary engines or gensets requires pressurization, which demands a redundant expensive compression train.

"On some vessels you can use a Type C tank to allow pressure to accumulate," explained Tauriainen.

"But what most vessels need is a safe solution for burning off the gas at low pressure.

That can be a GCU on LNG carriers, but the best and most economical solution for vessels using LNG

as fuel is usually a dual-fuel boiler," he added.

A boiler, either for producing steam or for heating thermal oil or water, is equipment that vessels need anyway.

Since an Aalborg dual-fuel boiler can



Proof of expertise: Aalborg OL dual-fuel Alfa Laval Test and Training Centre

be fired with LNG, it can take on the additional safety function of BOG management.

"Boilers are a compact, simple and highly affordable way to handle boil-off gas," said Tauriainen.

"As strange as it may sound, our Aalborg dual-fuel boilers have been the enabler for LNG propulsion in many, many projects," he added.

Smarter preparations for LNG tank inspection: Aalborg boilers, like the GCU, have yet another advantage when it comes to BOG management. Every fifth year, when a vessel enters dry dock for inspection, the tank environment must be made non-hazardous by replacing the LNG with inert gas.

During this process, Aalborg dual-fuel boilers are capable of burning the mixture of inert gas and LNG.

"Inert gas itself doesn't burn, so the

mixture resulting from the inerting process can't be fed to an engine or genset," said Tauriainen. "It can be fed to an Aalborg dual-fuel boiler, however. So the boiler offers a time-saving and economical solution to this recurring issue, which otherwise has to be solved by visiting an onshore disposal terminal before and after dry docking," he stated.

Flexibility

Clear modes to support customer operations: In short, Aalborg dual-fuel boilers offer a high degree of flexibility in BOG management. To make it easy for customers to use them, Alfa Laval has equipped the boilers with four specific operating modes:

• Steam production mode

In this mode, the boiler generates steam to serve the various steam consumers on board. The dual-fuel boiler functions

LNG is on the upswing, due to its role in reducing emissions and its relative economy compared to today's low-sulphur fuels.

evaporated gas that can increase tank pressure.

Alfa Laval is well known for BOG management on LNG carriers, where the Alfa Laval Gas Combustion Unit (GCU) safely burns BOG in compliance with the

much as an oil-fired boiler would, with the burner modulating the flame but using LNG as the fuel source.

- **BOG mode**

This is the main mode for controlling pressure in the vessel's LNG tanks, in which any unutilized steam is dumped via the vessel's dump condenser. The burner load is determined by a signal from the vessel's fuel gas handling system or a monitoring system, which informs the boiler control system of the required gas consumption rate. A feedback signal is returned to confirm the burner

load level.

- **Full free-flow mode**

This mode, in which a free flow of uncompressed LNG is sent to the burner, can be used when gas compression is not available. In other respects, the operation is similar to BOG mode, with excess steam being dumped via the dump condenser.

- **Gas-freeing and gas-filling mode**

This mode is used before and after dry docking, in order to prevent the venting of gas to atmosphere during tank inerting

and gassing up. The burner consumes the vent gas mixture of LNG and inert gas, which is unsuitable for combustion by the engine or genset.

These modes meet all vessel needs and fulfil the requirements of classification societies. In addition, the BOG mode can be equipped with GCU functionality, giving it added system redundancies. This ensures that the boiler is always available to burn BOG.

A century of boiler expertise - and more: Considering the importance of

boiler technology to the overall LNG equation, Alfa Laval's expertise and resources offer important assurance to ship owners and operators. Alfa Laval has supplied, optimized and supported boilers for 100 years, and has sold over 100 Aalborg dual-fuel boiler systems to date. That experience is paired with BOG know-how from the GCU, plus R&D muscle at the Alfa Laval Test & Training Centre in Aalborg, Denmark, a 1350 m2 facility with a dedicated wing for gas and combustion solutions.

Designed

"Our Aalborg dual-fuel solutions are designed with boil-off gas in mind and are influenced by our experience with the GCU," says Tauriainen. "The boiler uses LNG efficiently for heating, but by managing the boil-off gas and making LNG propulsion possible, it also enables far greater savings. GCU or boiler, steam or thermal fluid - we have a solution to make LNG propulsion happen, on any size or type of vessel."

Full service backing where it matters most: Since every aspect of BOG management is linked to safety, Alfa Laval's organizational strengths also come into play. As a full-scope marine supplier, Alfa Laval provides not only in-house engineering and manufacturing, but also peace of mind through commissioning and a well-established global service network.

"Responsiveness is crucial in safety applications," says Tauriainen. "We've spent decades building up our boiler services, and we can meet vessels at their next port in the vast majority of cases. In an emergency, we also have field service engineers who can be dispatched to sea."

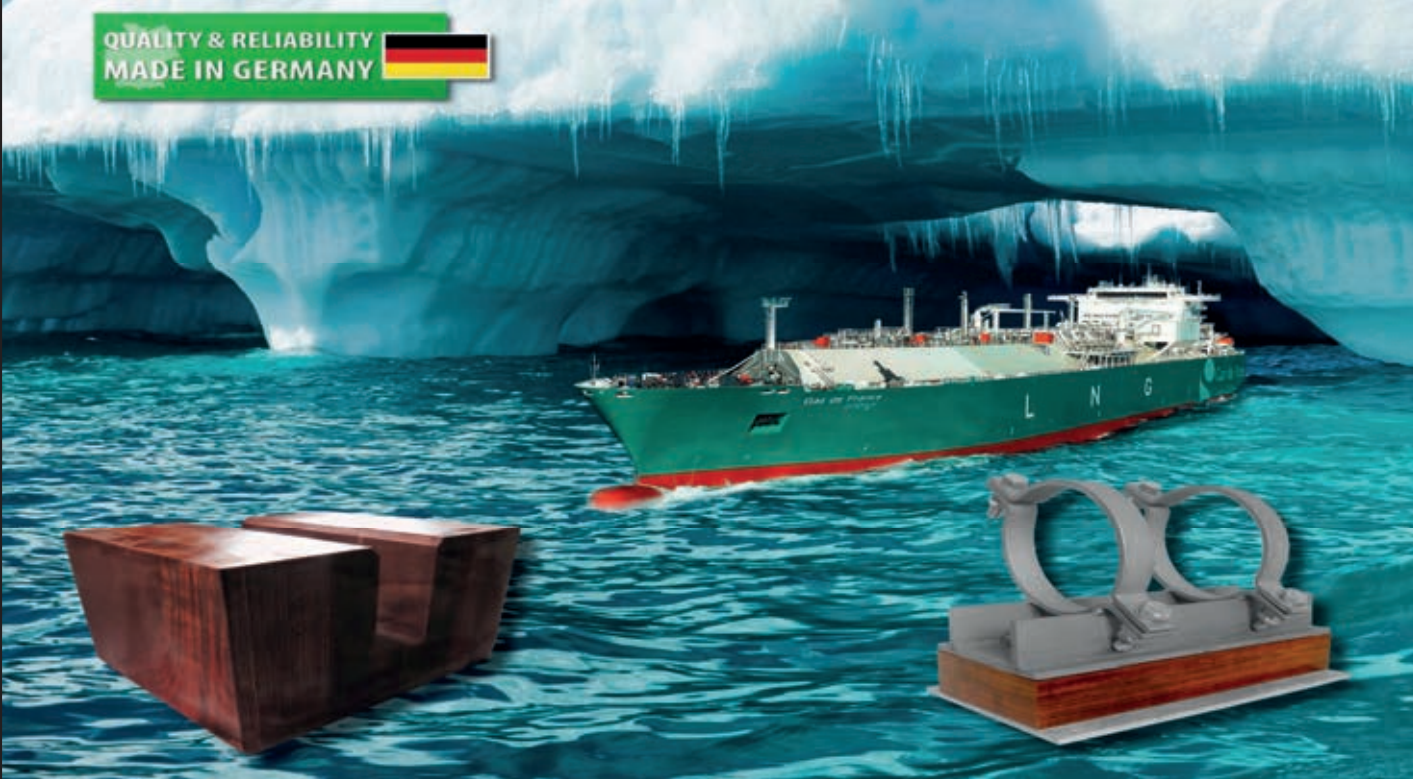
In fact, Alfa Laval service expertise is closer than ever, thanks to a growing range of digital services. Alfa Laval BOG solutions all make use of Alfa Laval Touch Control, a next-generation control solution with an easy-to-use touchscreen interface. As well as providing crews with common controls for all BOG-related equipment, Alfa Laval Touch Control offers a platform for data-driven maintenance and optimization.

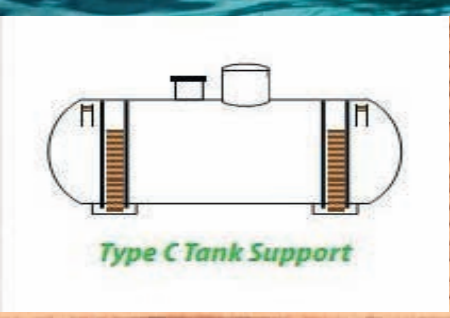
"Customers today want immediate solutions for converting to LNG propulsion," says Tauriainen. "They'll find them at Alfa Laval. But we'll also support customers as time goes on, so that they can achieve greater savings and peace of mind over their solution's lifetime."



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Mediterranean nations widen their service offerings in re-loads, micro-liquefaction and small-scale LNG

Terminal sector is on the development path in southern Europe

Italy, with its strategic position at the centre of the Mediterranean, could in the future become a liquefied natural gas re-loading hub for shipping as more LNG-powered vessels are built.

The country is the third-largest European consumer of natural gas and dependent on 92 percent of its gas from imports via pipeline compared with a European Union average of 70 percent.

For this reason, Italy needs to build a strategy for the security of supply.

Currently, there are three LNG import terminals in operation.

Strategy

One of these is OLT Offshore LNG Toscana off the Italian West Coast, which is giving its special contribution to the country in terms of diversification of sources.

The terminal has received LNG shipments from most of the major producers around the world, including Algeria, Cameroon, Egypt, Equatorial Guinea, Nigeria, Norway, Peru, Qatar, Trinidad and Tobago and the US.

OLT Offshore LNG Toscana has also regasified reloaded cargoes from Spain and the Netherlands.

The terminal can handle LNG carriers with a cargo capacity up to 180,000 cubic metres, meaning it can potentially host 90 percent of gas carriers currently in service.

Capacity

The plant has a regasification capacity of 3,75 billion standard cubic meters and in the gas year 2018-2019 worked at around the 97 percent of its maximum authorized capacity.

For the current gas year all the capacity has been booked until September 2020.

OLT initiated the authorization process to offer a "Small Scale" service on March 2019, aiming to allow small-scale carriers to load LNG directly from the terminal.

Soon after the authorization process, it is estimated that the terminal modification works would last 12 months.

Last year Italian LNG imports grew by 70 percent. From this perspective many

other LNG projects have been proposed, for example LNG coastal supplies to the ports of Napoli, Venezia, Augusta, Cagliari and Livorno.

Some companies are investing in LNG projects aimed at developing the SSLNG logistics chain in transportation.

Micro-liquefaction

Particularly there's interest in building micro-liquefaction plants all over the country, supporting the expected growth of LNG for trucking and in the future the development of BioLNG.

An LNG storage facility is already in construction in the port of Oristano, Sardinia, which should be operating by the second half of 2020.

This mini-terminal will be the first coastal SSLNG storage in Italy and the second one in the Mediterranean, coming after the British territory of Gibraltar, in the West Med, started receiving cargoes for its gas-fired power plant.

The Oristano storage will help Sardinia to switch from pollutant fuels to natural gas in all sectors, such as marine, road transport, industries and the civil network grid.

Another important project is the first coastal storage in Ravenna, which could become operational by 2021, with a forecast turnover of 1 million cubic metres of LNG per year.

Initiatives

All these initiatives are a clear sign that Italy is finally becoming a more mature LNG market, starting to develop the SSLNG logistics chain, from storage to distribution and in particularly consumption.

According to the last World Gas Report issued by the International Gas Union in October 2019, the global natural gas market experienced dramatic growth.

The increase year-on-year was 4.9 percent, the fastest annual rate since 2010.

In total, gas accounted for nearly half the growth in global primary energy demand in 2018.

Two-thirds of the international gas trade growth was driven by LNG a market that recorded in the past two



Carrier at the OLT Offshore LNG Toscana facility off Italian West Coast

years the strongest growth period since 2010-2011.

In 2018 the amount of LNG traded reached the historic record of 316.5 million tonnes with an increase of around 10 percent compared to previous year.

This result was driven by a significant growth in LNG export capacity from Australia, Russia and the US that over the course of 2018 added roughly the 8 percent of global liquefaction capacity.

Output

This LNG new supply and the rapidly growing gas production worldwide were the greatest driver of declining natural gas prices. Similar strong growth in the LNG market was experienced in 2019.

A niche market linked to the LNG market is the SSLNG market, where the LNG is used for transport with great environmental benefit.

Carbon-dioxide emissions, nitrogen oxide, sulphur oxide and particulates coming from heavy transport by land and by sea are reduced by LNG use in the sectors.

This will be an important element for the development of the green economy, now part of EU policy.

Small-scale

In Europe, the SSLNG market is constantly growing. The tightening of environmental laws at international level continues. The International Maritime Organization sulphur cap on maritime fuel, from 3.5 percent to 0.5 percent, is

now in force. The IMO regulations have encouraged ship owners to increase orders for a variety of LNG-powered vessels.

These include cruise liners, as well as the ferries, support vessels, RoRo and tugs already operational in the North Sea, in the Channel and in the Baltic Sea that has been an Emission Control Area since 2016.

Even the Mediterranean Sea could become an ECA zone by 2022. France and Spain already agreed on this proposal and Italy recently gave its approval.

This should give momentum to the implementation of more LNG bunkering availability.

France, Spain, Malta, Greece, Cyprus and Turkey are interested in LNG for maritime uses, having presented numerous projects.

Enagas, the Spanish LNG terminal operator, in 2016, signed an agreement with Barcelona Port Authority for the development of the port into a Mediterranean LNG hub for bunkering.

The Barcelona LNG terminal has also started SSLNG operations on a regular basis allowing the bunkering of the first LNG-fueled cruise ship in the Mediterranean.

Another good example in SSLNG services offered by LNG terminals is the French LNG terminal at Fos sur Mer near Marseille that, after a positive expression of interest on SSLNG services in 2017, went ahead with its SSLNG reload service project. ■



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
AmanI	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



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
Billis	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



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



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

CARRIER FLEET



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



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 Eurys	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

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	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, Zhejiang	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	Capacity
Japan (continued)	Mizushima	Nippon Oil, Chugoku Electric	2006	2	320,000
	Sakaide	Shikoku Electric, Cosmo Oil	2011	1	180,000
	Ishikari LNG	Hokkaido Gas, Hokkaido Electric	2012	2	380,000
	Okinawa	Okinawa Electric Power	2012	2	280,000
	Naoetsu	Inpex	2013	2	360,000
	Joetsu	Chubu	2011	3	540,000
	Hachinohe LNG	Nippon Oil	2015	2	280,000
	Hitachi LNG	Tokyo Gas	2015	1	230,000
	Soma Fukushima	Japan Petroleum Exploration	2017	1	225,000
Korea	Boryeong	GS Energy, SK E&S	2017	3	200,000
	Incheon	Kogas	1996	20	2,880,000
	Kwangyang	POSCO	2005	4	530,000
	Pyeong-Taek	Kogas	1986	23	3,360,000
	Samcheok	Kogas	2014	3	600,000
	Tong-Yeong	Kogas	2002	17	2,620,000
Malaysia	Pengerang Johor	Petronas Gas	2017	2	400,000
Mexico	Altamira	Vopak, Enagas	2006	2	300,000
	Energia Costa Azul	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	Capacity
China	Shenzhen	CNPC Yudean Power	2021	2	120,000
	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, Pertamina	2012
Italy	Livorno	OLT Offshore LNG Toscana	2013
Jordan	Aqaba, Jordan	Golar LNG	2015
Kuwait	Mina Al-Ahmadi	KPC	2009
Lithuania	Klaipeda	Klaipedos Nafta Hoegh LNG	2014
Malaysia	Malacca FSRU	Petronas	2012
Malta	FSU Armada Mediterranea	ElectroGas	2016
Pakistan	Port Qasim	Excelerate, Engro Corp	2015
	Port Qasim	BW-Mitsui, PGP Consortium	2017
Turkey	Aliaga FSRU, Turquoise FLNG	Etiki LNG	2016
	Dortyol FSRU Challenger	Botas	2018
UAE	Ruwais, Abu Dhabi	Gasco (UAE)	2016
	Jebel Ali Port, Dubai	DSA (UAE)	2010
UK	Teesside GasPort	Excelerate	2007

LNG Export Projects

Country	Location/Project	Project Developers	Planned Start Up	Number of Trains	Capacity In MTPA
AUSTRALIA	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
	Corpus Christi Liquefaction, Texas	Cheniere	2019	2	9.0
	Delfin LNG, Louisiana	Delfin	2023+	3	9.0
	Driftwood LNG, Louisiana	Tellurian, Total and others	2023	6	27.6
	Freeport LNG, Texas	Freeport LNG	2019	3	15.3
	Galveston Bay LNG	NextDecade	2023+	6	27.0
	Golden Pass, Texas	Qatar Petroleum, ExxonMobil	2021	3	15.6
	Jordan Cove, Coos Bay	Pembina Corp.	2024	2	7.8
	Lake Charles, Louisiana	Shell, ETE	2024	3	15.0
	Magnolia LNG	Louisiana LNG Ltd.	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 1994	2 1	3.2 2.5	3	240,000
ALGERIA	Arzew	Sonatrach GL4Z	1964	3	1.1	3	35,000
	Arzew	Sonatrach GL1Z	1978	6	7.8	3	300,000
	Arzew	Sonatrach GL2Z	1980	6	8.0	3	300,000
	Arzew	Sonatrach	2014	1	4.7		
	Skikda	Sonatrach GL1K II	1980	3	3.0	5	308,000
	Skikda	Sonatrach (rebuild)	2013	1	4.5		
ANGOLA	Soyo	Sonangol, Chevron, BP, ENI, Total	2012	1	5.2	2	370,000
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 (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					
PAPUA NEW GUINEA	PNG LNG	Oman Govt., Oman LNG Union Fenosa, Osaka Gas, & Itochu	2006	1	3.7	2	240,000
		ExxonMobil, Oil Search, Santos, JX Nippon Oil	2014	2	6.9	2	320,000
PERU	Peru LNG	Hunt Oil, Shell, Marubeni, SK Group	2010	1	4.4	2	260,000
QATAR	Qatargas 1-T1&2	QP, ExxonMobil, Total, Marubeni, Mitsui	1997	2	6.4	4	340,000
	Qatargas 1-T3	QP, ExxonMobil, Total, Marubeni, Mitsui	1999	1	3.1		
	Qatargas II-T1	QP, ExxonMobil	2009	1	7.8		
	Qatargas II-T2	QP, ExxonMobil, Total	2009	1	7.8	8	1,160,000
	Qatargas III-T1	QP, ConocoPhillips, Mitsui	2010	1	7.8		
	Qatargas IV-T1	QP, Shell	2010	1	7.8		
	RasGas I- T1&2	QP, ExxonMobil, Kogas, Itochu, LNG Japan	1999	2	6.6		
	RasGas II- T3	QP, ExxonMobil	2004	1	4.7		
	RasGas II- T4	QP, ExxonMobil	2005	1	4.7	6	840,000
	RasGas II- T5	QP, ExxonMobil	2007	1	4.7		
	Rasgas III – T6	QP, ExxonMobil	2009	1	7.8		
	Rasgas III – T7	QP, ExxonMobil	2010	1	7.8		
RUSSIA	Sakhalin Island	(Sakhalin Energy) Gazprom, Shell, Mitsui, Mitsubishi	2009	2	9.6	2	200,000
	Yamal LNG Siberia	Novatek, Total, CNPC, Silk Fund	2017	3	16.5	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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