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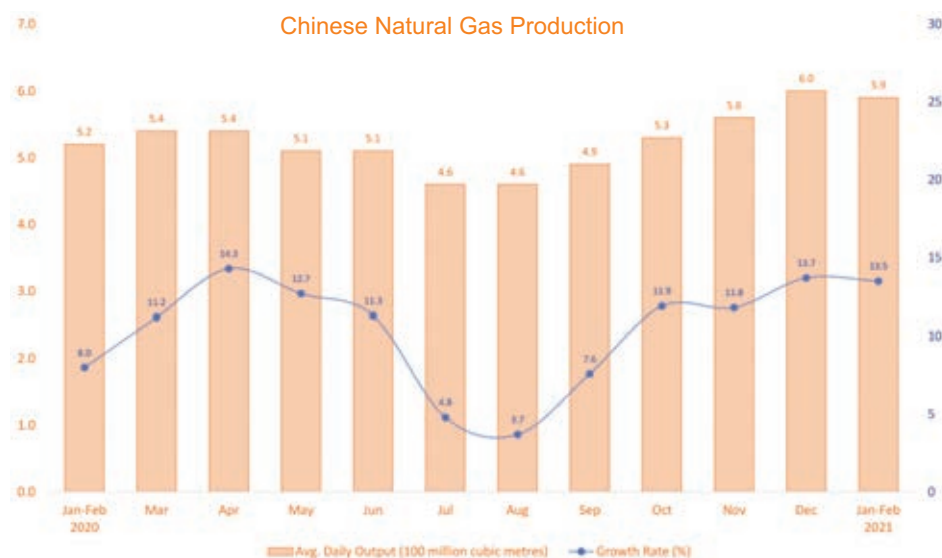
China – LNG and energy transition

China's new Five-Year-Plan stands alongside ambitious emissions goals whilst emphasising energy security. With energy demand set to grow, however, carbon fuels are likely to retain their importance, which places pipeline gas and LNG on the spot to lead an energy transition. Markets Editor Alexander Wilk reports.

China's National People's Congress ratified and published the 14th edition of the country's Five-Year-Plan (FYP) on 11th March. Whilst previous FYP iterations have also been eagerly expected and scrutinised to gain insights on Chinese energy policy, this year's update is likely to be of particular significance. In a recorded video message to the United Nations General Assembly in September 2020, China's President Xi Jinping committed the People's Republic on a path to peak greenhouse gas emissions before 2030 and carbon neutrality by 2060. This was reiterated by China's State Council through its resolution 'Energy in China's New Era' in December 2020, which in turn is rooted in China's energy strategy of 'Four Reforms and One Cooperation', encompassing energy security and market liberalisation. However, several policy decisions and economic currents within China are at odds with the current FYP's climate goals due to the unrelenting rise in the country's energy demand. We see pipeline gas and LNG as a crucial clean-burning fossil fuel to facilitate China's transition towards the FYP's climate goals.

Caution advised

Although China's climate goals are welcome and necessary, we think bold energy-related statements need to be treated with caution. Despite presidential pledges of peak carbon emissions in 2030 and carbon neutrality by 2060, the latest FYP provides only initial pointers to how the country aims to decarbonise its economy. Moreover, when assessing the FYP in conjunction with policies introduced before and after the Plan's publication, some of its goals are in conflict with those policies – especially those concerning China's coal industry. Chinese gas consumption has traditionally been part of an interplay between other competing sources of



energy, which makes policy concerning those as important as gas-specific policy.

Importantly, we think as China's economy will be continuing to expand away from low-end manufacture to higher-value industries and services, national electricity demand will also increase. Apart from higher-end manufacture of electronics, large-scale infrastructure projects such as an expanding intercity rail transit system and an even more widespread use of electric vehicles is likely to push up electricity demand considerably. That demand will have to be met.

Gas competitors

In essence, the 14th FYP is a general framework to throw light on China's political and economic path forward and thereby sets out both binding and aspirational targets. Much of its implementation will be left to provincial governments who in turn will produce their own plans in the future that will furnish more details and specific targets. This is an important mechanism to maintain – as much as possible – the targets' achievability.

Coal

Accordingly, it is important to note that China's FYPs are often grounded in

political and economic reality. In our view, the 14th edition is no exception. The current FYP continues to accommodate the development of coal whilst mentioning the 2060 carbon neutrality goal only once, thus hinting at the actual weighing of priorities by China's central administration. Energy security is likely a key motivator and the current FYP introduced a binding floor for domestic energy production of 4.6 billion tonnes of standard coal equivalent (tce).

At the same time, China's 12th FYP (2011-2015) left the country with significant overcapacity in its coal-fired power sector and the country's State Grid as well as the industry body China Electricity Council have been lobbying hard to secure a prominent role for coal in China's energy mix going forward. China's installed coal-fired power capacity currently amounts to c. 1.1 terawatts (TW) – with 0.1 TW of new capacity still under construction – whilst the average age of Chinese coal-fired power stations is only around 12 years with capacity utilisation around 50 percent, according to research by the China Electricity Council.

Echoing some of the goals set out in the 14th FYP, Chinese coal production accelerated rapidly by 25 percent in January and February over the same

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period last year, whilst concurrent coal imports plummeted by almost 40 percent, according to government statistics.

Taking these strands together, it appears is going to is going to a greater share of coal in its energy mix – at least in the current FYP-period. Ample spare capacity is likely to grow as new facilities are commissioned and the country can rely on a significant domestic resource base, which together are in line with the FYP's energy security objective. Moreover, a significant share of the country's workforce is tied to the industry for income, housing and social security. However, using spare conventional coal capacity flies in the face of Beijing's proclaimed emissions targets. Although China has previously begun to implement coal-to-gas technologies, the new FYP does not set out specific goals for that technology.

Crude oil

In contrast to coal, China struggled to raise crude oil production from its ageing fields in the same rapid manner. Although year-on-year output had increased by 4 percent in December 2019, that growth amounted to only 0.4 percent to 32.08 million tonnes in December 2020 whilst the monthly growth rate oscillated between 2.4 and -0.1 percent that year. This growth equated to average daily production of only 0.54 million tonnes per day compared to daily refining demand of 1.94 million tonnes in 2020, government data shows.

Non-fossil energy

Apart from traditional hydrocarbons, the 14th FYP plan states China will boost the share of non-fossil sources in its energy mix, which comprises everything from nuclear to hydropower, from a targeted 15 percent in the 13th FYP to roughly 20 percent by 2025. Nevertheless, we highlight that the wording of the goal as well as the absence of firm overall capacity targets suggest the 2025 projection remains aspirational for the time being. Notably, nuclear power was the only non-fossil energy source with a capacity goal of 70 gigawatts (GWe) by 2025, up 18 GWe from c. 53 GWe currently. According to the World Nuclear Association, China has a total of 15 reactors due to start by 2025/26, totalling 17 GWe in capacity. Around 39 projects totalling c. 43 GWe were still in various planning stages at the time of writing, with the majority without a clear construction horizon. Consequently,



Source: LNG Journal Data

whilst there is a sizeable roster of Chinese nuclear projects on the books, nuclear power capacity is unlikely to reach even 10 percent of its fossil fuels equivalent by the end of the current five-year planning period.

Gas & LNG

Although the 14th FYP's does not contain specific goals for China's natural gas sector – they are typically released later throughout the year – several official statements are nonetheless offering insights into the central administration's priorities. Two main themes stand out: accelerating China's low carbon transition and energy security. The current FYP specifies that China should 'strive to increase the storage and production of oil and gas' and 'accelerate the construction of natural gas network pipelines', which is consistent with the requirements set forth in the previous FYP.

China has been trying to significantly advance its domestic natural gas production for years but despite some successes has struggled to move past difficult production circumstances ranging from geology to gas composition when trying to scale output in line with demand growth. Domestic natural gas production grew rapidly by 13.5 percent year-on-year in the period of January to February and a 22.5 percent increase over January/ February 2019. However, the average daily output was down 0.01bcm over December last year, suggesting continued growth is not a foregone conclusion. At the same time, natural gas imports were up 17.4 percent year on year, according to China's National Bureau of Statistics.

In its 'No 1 Central Document' for 2021 – i.e. the first policy document of the year, which typically addresses rural and agricultural topics – China's State

Council highlighted the goal to improve rural access to natural gas supply as part of its clean energy infrastructure policy, which points to gas an important transition fuel.

Rising demand

Whilst gas-specific goals for China's energy mix during the current FYP period remain to be confirmed, Sinopec, one of China's largest oil and gas companies, expects natural gas consumption to reach around 340-345bcm in 2021, up 6-8 percent from its earlier estimate of 320bcm in 2020. Fellow state-owned conglomerate CNPC sees Chinese gas consumption to reach 430bcm by the end of the current FYP period in 2025.

The communicated outlook is thus one of expected strong demand growth. In line with that expansion China is expected to commission five LNG terminal expansion projects and two greenfield facilities in 2021, which together will add roughly 17mtpa of LNG import capacity. Consequently, we are anticipating robust LNG demand growth in China in 2021. LNG imports reached 68.21mmt in 2020, our data shows, growing robustly by almost ten percent from the 61.41mmt recorded in 2019. We are expecting similarly robust growth for 2021, with LNG imports during the first 12 weeks this year already 44 percent higher than in 2020.

However, we caution that the utilisation ramp-up at the Power of Siberia Pipeline may put a timer on strong LNG import growth as the pipeline is planned to double throughput to 10bcm this year and continue to increase annual flows to 38bcm by 2025.

Moreover, the current FYP urges state-owned majors, which will now face stiffer competition in China's LNG market, to enhance efforts in boosting domestic gas production. As discussed above, domestic

output rose sharply in 2020 and we are expecting robust growth in 2021, too. The 14th FYP may not include specific output goals, but its focus on supply security throughout is likely to impress upon state-owned companies where to pivot to. Still, output growth will ultimately be determined by factors such as geology and domestic market conditions, including pipeline connectivity, which would also help in the expansions of China's domestic LNG market.

Innovation & reform

Even before the introduction of the 14th FYP, government policy was working towards structural market changes, including more freedom for independent buyers of LNG to trade on their own account. The apparent goal was to support the continued adoption of natural gas in the market by allowing smaller accounts to purchase flexible quantities from independents. Full implementation has yet to be completed although BP's LNG supply deal with ENN last summer, for example, is reflective of that policy. Moves towards higher market liberalisation also enabled Chinese company Jovo Energy to receive an LNG cargo via the Hainan LNG terminal. However, granting terminal access is only useful if imported LNG can then be distributed efficiently.

PipeChina

Accordingly, the Chinese government created the state-run entity China Oil & Gas Piping Network Corp. (PipeChina), a state-owned midstream pipeline company with the remit to facilitate third-party access to the national gas pipeline grid and thereby increase gas import optimisation. Whilst the launch of PipeChina in October last year was

plagued with several safety and supply issues that enabled China's three state-owned majors to point the finger at the new company, it was nonetheless a crucial step in the direction of a more liberalised Chinese gas market.

However, a step in the right direction it remains for now. Crucially, there are strong indications PipeChina was not brought to life to promote private enterprise but to redistribute supply risk and thus enhance security in line with the new FYP. A central role for the company is the administration of a platform through which any third party must first apply for shortlisting before LNG import and pipeline capacity is allocated. However, sources talking to Platts have claimed they may be mandated to buy long-term cargoes from the 'Big Three' state-owned terminal operators (CNOOC, CNPC and Sinopec) at oil-linked prices. Rumours also pointed to a 'one-plus-one' system, whereby the purchase of an independent spot cargo must be followed by the purchase of a long-term cargo from one of the state-run majors, a system akin to CNOOC's regime before the launch of PipeChina. The 'Big Three', and by extension the Chinese state, seem to be keen to share out the risk of long-term purchasing commitments to smaller competitors in return for regulated access to infrastructure. If true, however, this price policy could dampen initial enthusiasm for market liberalisation by independent market participants, we think. As of March, PipeChina had yet to complete its vetting process, which includes the signing of terminal use agreements, so that these contract terms could not be confirmed.

Once these regulatory hurdles are cleared, however, we expect third-party

access to China's midstream network to increase sharply – from a very low base, of course. In our view, smaller Chinese gas suppliers such as ENN, Jovo and Shenzhen Energy will have little choice but to acquiesce to more restrictive terms than first anticipated since the alternative would be to be denied access.

Carbon-neutral LNG

Another aspect is the potential for an increase in carbon-neutral LNG deliveries. Shell has delivered seven carbon-neutral cargoes to Asia since 2019, inter alia to CNOOC Gas & Power, Tokyo Gas and Taiwan's CPC. In March, the supermajor and Russian gas champion Gazprom delivered Europe's first full-cycle carbon-neutral LNG cargo to the United Kingdom's Dragon LNG terminal. According to a Gazprom statement, the Russian company and Shell were jointly offsetting the cargo's carbon footprint across its entire value chain, spanning field production, liquefaction, transportation and final consumption. Although only a trickle at the moment, these carbon-neutral deliveries underscore LNG's potential as a transition fuel for China's mission to achieve peak-carbon by 2030; not just due to suppliers willing to innovate and cooperate, but also due to LNG's relatively small carbon content compared to coal or crude oil.

Concluding thoughts

Published Chinese policy has set high-profile emissions goals. However, it should be noted that they do not call for a net emission cut but instead a peak by 2030. The 2060 target, meanwhile, is too far into the future to be discussed with any degree of certainty. The new FYP also does not provide a detailed plan for

reaching it. However, it does make clear provisions for energy security on the implied expectation of continued energy demand growth along the path to eventual carbon neutrality forty years hence.

We therefore think coal is likely to remain the bedrock of China's energy portfolio for the duration of the current FYP. Even before the Plan was formalised, the country's National Energy Administration had signalled further relaxation of permitting rules for new coal-power construction. We also highlight that the coal industry is a key state-controlled sector on which large swathes of Chinese workers are dependent for their social security. As such, we expect China to continue to invest in coal.

What is unclear is the rate of that investment – is it merely to preserve the status quo or to expand its use? There can be little doubt that a reduction in the consumption of coal through conventional thermal power stations would be an effective component in the reaching of China's proclaimed emissions goals.

In our view, this calls for a low-carbon transition that will have to rely on an increase in gas consumption. Importantly, the process of incremental switching to an energy portfolio leaning more towards renewables is likely going to increase the need for flexible energy supply, of which LNG is among the cleanest with some carbon-neutral deliveries already completed. Meanwhile, sustained growth of pipeline gas imports unfolds relatively slowly over several FYP periods although China is working hard to expand its domestic pipeline network to provide greater connectivity.

Accordingly, we welcomed the news of the BP-ENN deal and the inauguration of PipeChina as vital signs that national LNG infrastructure will increasingly be open to private players offering industrial enterprises more flexible gas supply. A freer domestic market holds the promise of improved price discovery and increased LNG uptake. However, the emphasis is on 'increasingly' as PipeChina seems to be more of a tool to distribute risk than to throwing the doors open to a liberalised gas market.

Nevertheless, we think China's latest FYP alongside already implemented policy provide significant impetus for continued Chinese LNG demand growth during the energy transition in the current FYP period. ■

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How to navigate customers through volatility?

CEO of MET International, György Vargha talks to LNG Journal's Markets Editor Anja Karl about why it is so important to manage risks in an integrated way.

LNG exporters and gas utilities operate in an ever more volatile energy sector – with climate and economic risks, due to the ongoing Covid-19 pandemic, all adding up and leading to a greater sensitivity of oil and natural gas prices. How does MET International assist its customers with this?

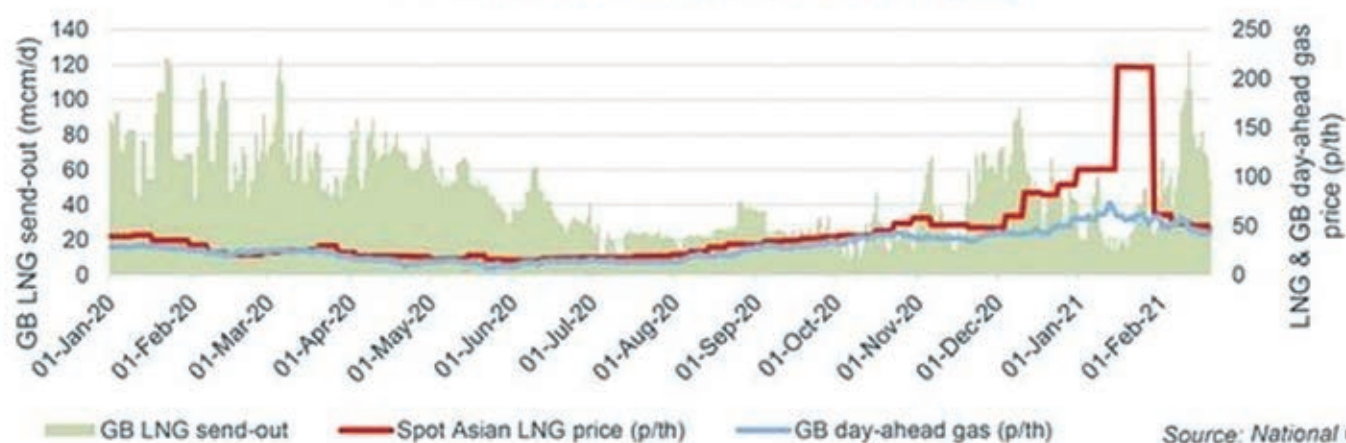
“Our customers have three key pricing challenges. First, they want to achieve a price that is better than what their competitors can get. Second, they have a budget from an energy procurement perspective that they need to stick to and third, they need to keep an eye on the prices of their end product in relation to their energy costs,” Vargha said, explaining the most direct link is to be found in the fertilisers market, where the feedstock is natural gas; but also, to a lesser extent, in companies that make things for consumers where the output is linked to the general inflation. “They need to manage all three in tandem in a volatile and often illiquid and untransparent environment,” he said, calling the conundrum a “big challenge” for customers.

Rising gas-on-gas competition

Gas prices have become more volatile in the past years as oil indexation has been replaced by gas hub indexation in most long-term import contracts. Rising gas-on-gas competition, in turn, has boosted the role of CCGTs in the energy mix with gas peaking plants assuming a price-setting function for electricity wholesale markets and a central element in a nation's gas demand profile. On a macro-



LNG supply volumes against spot Asian LNG price



economic level, the role of Europe as a ‘last resort LNG buyer’ has increased considerably, making prices at UK's NBP gas trading hub or the Dutch TTF much more volatile. For example, when spot LNG prices in Asia soared this winter, day-ahead gas prices in the UK reached their highest level in three years, hitting 73.50 pence per therm (p/th) on 12 January, while gas contracts along the forward curve also saw prices rise significantly.

Looking at Europe's largest suppliers, traditional contracts that Russia's Gazprom and Norway's Statoil had with

large importers like E.ON and GDF Suez were linked to the oil price with 3 to 9 months lag and kept that fix price for 1 to 3 months. “These contracts usually had some inherent flexibility for the buyers, meaning that for 1 to 3 months there was an important fix price anchor in the market to price against,” Vargha explained, noting “much of these contracts have been replaced by hub indices without flexibility, and as such large import volumes are only linked to the fundamental dynamics of the gas markets without fix price anchors.”

Global LNG prices, on one hand, but also wholesale electricity prices and the influence of rising intermittent power supply from renewables all have an impact on a nation's gas demand and prices. LNG prices are much more volatile than gas prices: in the last year alone, the price has moved from around €5 per Megawatt-hour (MWh) in the summer to as much as €100 per MWh this winter.

Pointing out the reasons for this, Vargha said: “LNG markets feature huge quantities in single cargo shipments, largely unpredictable demand and inflexible supply patterns. Europe is extremely important for the LNG markets to place cargoes not needed by Asia. This, nevertheless, exposes Europe to the huge volatility of global LNG prices

and can remove substantial amount of supply destined for Europe in case other markets need the LNG.”

Gas helps overcome ‘intermittency challenge’

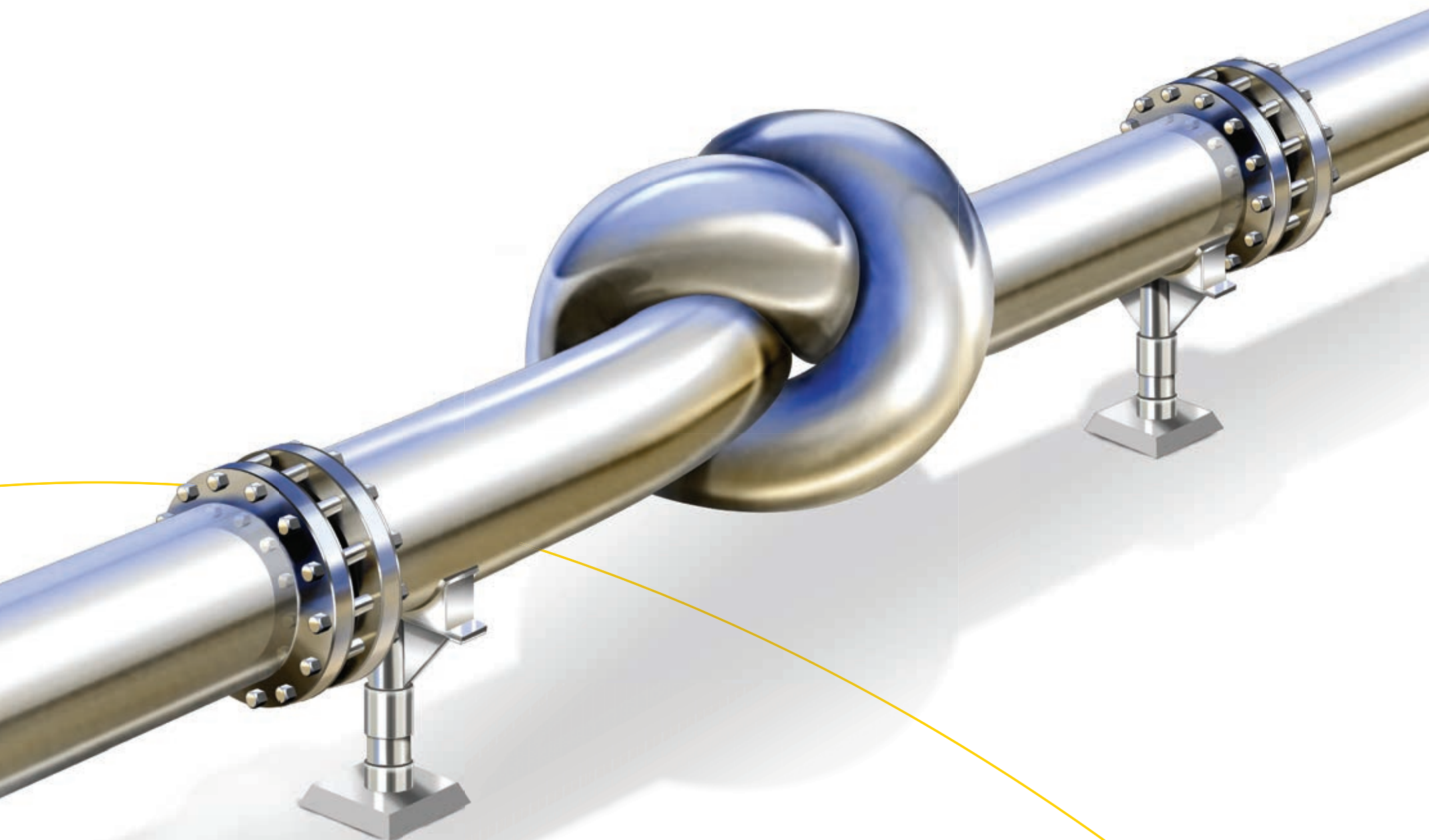
Wholesale power prices are also extremely volatile due to rising supply of wind and solar power, produced at zero variable cost, which are starting to outcompete fossil fuel-based power generation amid higher emissions pricing.

“As such, when substantial amount of wind is blowing, power prices can easily fall to 0 or become negative, whereas in low wind scenarios power prices have been moving between €40 and €60 per MWh. However, in the very short term, prices can even be + or - €1000 per Megawatt-hour (MWh), – insane compared to gas pricing,” he said.

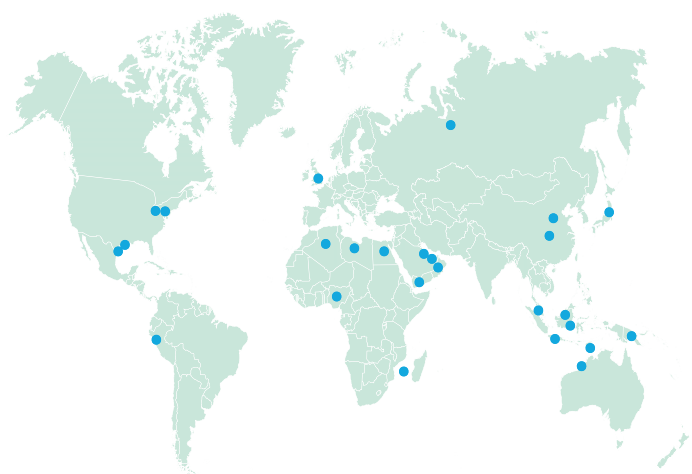
Gas peaking power plants are dispatched to balance an ever growing volume of intermittent renewable energy supply, hence flexible LNG supply and gas storage is getting more and more important. At the same time, gas production profiles are becoming less flexible at a time of comparatively low oil prices so the market's need for flexible spot LNG and the removal of oil formulae as fix price anchors have made gas prices spiral to unprecedented levels.



MET has booked firm capacity at Croatia's first LNG terminal on Krk island



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As an integrated energy company MET manages customers' risk exposure to natural gas, power, LNG and oil prices across all European hubs. Asked how it helps customers address this volatility, the CEO said MET strives to help them navigate through the rough times of volatility and illiquidity. "We are well-positioned to manage liquidity risks in an integrated way and help our customers understand the driving forces behind the price moves in the liquid markets – being a major participant ourselves," he said. "We are eventually building bridges – between liquid and illiquid markets, between traders and originators, between professionals coming from different cultures, between physical assets and commercial feasibility."

For example, MET can arrange gas sales in the Mediterranean region in countries such as Spain, Italy, Hungary, Slovakia, Croatia, Bulgaria which are illiquid from a physical gas perspective. "Local markets don't have depth and

customers don't necessarily see what prices are. Many of these markets are dominated by state-owned companies," Vargha said, stressing: "One way we are able to help our customers there to manage risk is by connecting them to the European markets with sufficient liquidity to hedge their exposures and provide an understanding to the price movements enabled by being active in the LNG and power markets as well as being fundamental drivers of the gas markets."

Offering regas capacities at Croatia LNG

"We recently booked capacities in the Croatian LNG terminal for a three-year period, amounting to 1.3 billion cubic meters overall. We will process 6 to 9 cargos per year there (the first full cargo this April) and if the price dynamics allow it, we can divert these cargos to other global LNG markets or even to Northwest Europe. We can also book some further slots on a short term basis. So we can

import into Italy, Spain, Greece and Turkey to feed our portfolios. It makes us a Mediterranean buyer of LNG into almost all markets there, creating a portfolio effect and hedging tools into all our illiquid gas markets," he said, noting this would give MET an exposure on how LNG players think – a knowledge it is willing to share with its partners.

"LNG traders work in a different way compared to power or fundamental gas traders, or hedge funds. By being active on a variety of markets impacting the European gas markets – as well as the majority of the local European gas markets themselves – we get an increased understanding on the overall dynamics and a good basis to proxy hedge exposures within this pan-European cross-commodity portfolio," Vargha said.

MET decided to book capacity in the Croatian LNG terminal "because the price was right, and it gave us the means to manage risk for Mediterranean customers," he said.

In terms of physical assets, the Hungarian company just completed the acquisition of Gas-Union's gas storage activities at four sites in Germany – Reckrod, Etzel, TGE and KGE – with a total working gas capacity of 3.4 TWh. These storage assets complement the build-up of gas sales to end consumers through the company's subsidiary, MET Germany. "All of these asset positions, be it direct asset investment or mid term positions, allow us to have a good trading understanding of the whole gas market in the most relevant regions," Vargha concluded.

Strategic focus shifts to renewables, energy storage

Looking to the future of gas risk management in the energy transition, the MET CEO underlined that "we will keep 'our feet on the ground'. We are very pragmatic in terms of investment." In the medium to long term, the company's seeks to significantly grow its renewables portfolio in the CEE region. To this end, it bought a 100% stake in Enel Green Power Bulgaria in January this year, and in October 2020 brought a new solar power plant in Hungary which produces green electricity to more than 23,000 households in the town of Kaba.

"But we are practical right now, and we know that power grids are struggling with the surge of renewable production because it is too volatile – the weather is unpredictable and day production is very different to that produced at night," he



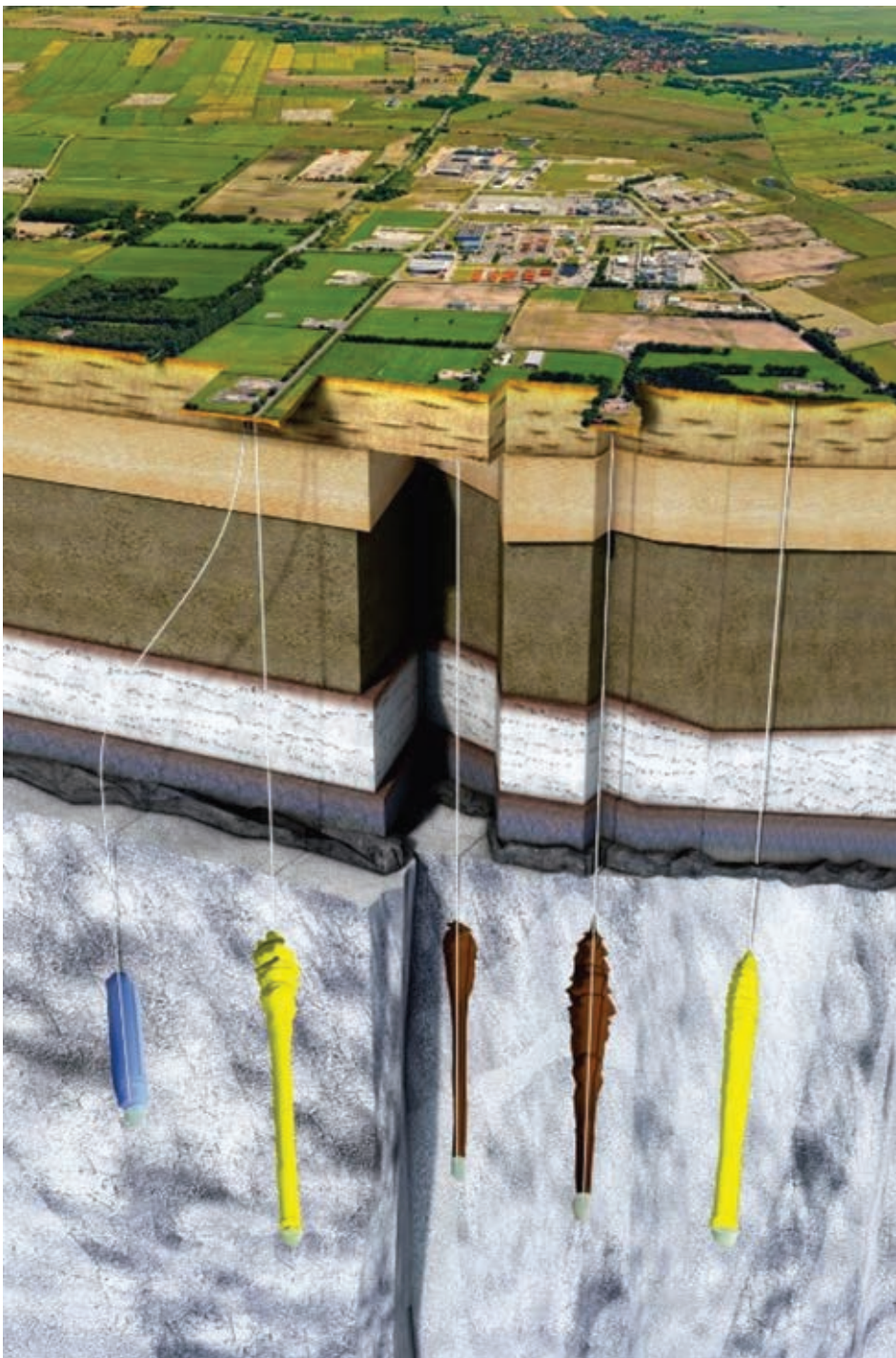
György Vargha, CEO of MET International

said calling on European policy makers to first solve power grid stability problems before decommissioning lignite power plants. "Gas peaking plants are a possible solution," he noted, "if hydrogen-based peaking technologies are well supported, if an early decommissioning of coal-fired plants is supported, if new-built peakers are incentivised by the governments, then they have their role." In the meantime, MET will continue with "opportunistic investment" in areas such as gas-based generation or gas storage, production or regasification.

No bet on hydrogen

Hydrogen is not part of MET's growth drivers just yet. "Because we are strategically focused on renewables in the long term and opportunistic on investment into gas-based infrastructure assets, we will not be getting into the hydrogen market just yet, where we see investments still in the R&D phase. We do not think we have the size or the experience right now for major research and development in this area," Vargha said.

Hydrogen is one of the solutions for the gas industry's future, and it is a greener, cleaner fuel that has had a lot of support in Germany and Italy, he acknowledged but stressed that MET can and wants to add value in other places. "We have strong local management on the ground so our partners can connect to real professionals locally. Nevertheless, we are coordinating our efforts centrally to share perspective and enjoy the synergies together," he said, concluding: "Managing this cultural complexity is a key competitive advantage that we leverage on, however difficult it is. Yet with the right mindset, it can add true market value." ■



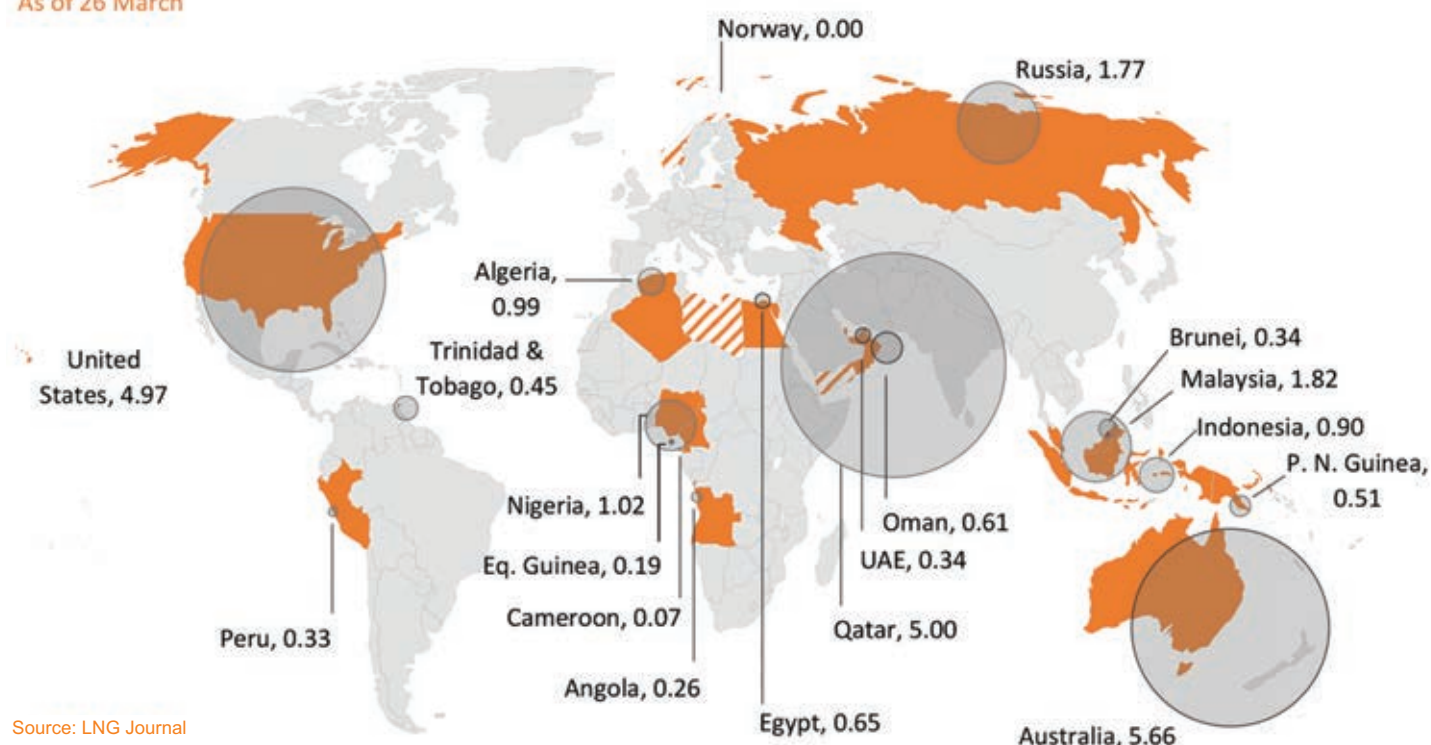
Scheme of Etzel gas cavern storage near Wilhelmshaven, Germany.

March LNG trade growth under pressure due to lower demand, maintenance & Suez blockage

Monthly LNG trade growth is likely to have been slowed by coinciding market factors, our preliminary data indicated in late March. A potential catching-up before month-end was made difficult by lower Far Eastern demand, scheduled maintenance and a blockage of the Suez Canal, our Markets Editor Alexander Wilk reports.

Our preliminary Market Tracker data showed global LNG trade to have seen a net decrease of 3.38mmt (-12 percent) month-on-month on 26 March. Notably, demand growth that had swung decisively towards the Far East in January is now swinging back towards Europe. This in turn affected several Pacific exporters. Production was also down at Russia's Sakhalin-2 plant due to scheduled maintenance. However, US LNG exports had already achieved vigorous month-on-month growth whilst Australia seemed on track to exceed February-levels, too. We therefore expect global LNG trade to have increased by around 2.62mmt at the end of the month. We also highlight that the traffic disruption at Suez is likely to cause only limited delay to LNG deliveries, especially in terms of Qatar's exports to Europe. Our data showed on 26 March that Qatargas had redirected two vessels away from Suez and around South Africa's Cape of Good Hope, which we expect will add around

Global LNG Exports
As of 26 March



Source: LNG Journal

two weeks additional journey time and potentially a higher loss in LNG due to boil-off.

Exports

As of 26 March, our preliminary data suggests month-on-month export performance is to come in above that of February, with shipments up by around 2.62mmt (9 percent). Exports are likely to be led by the Atlantic Basin, where shipments had already broadly reached February levels of 9.21mmt. In contrast, the Middle East and the Pacific were still left with some catching up to do, trailing their month-on-month equivalent by 1.31mmt (-17 percent) and 0.47mmt (-4.5 percent), respectively.

Pacific Basin

Pacific exports stood at 10.09mmt on 26 March, trailing their February equivalent of 10.51mmt by 0.47mmt (-4.5 percent). Consequently, Pacific capacity utilisation stood at 75 percent.

The Basin's biggest exporter – Australia – had shipped 0.11mmt (-2 percent) less month-on-month at the time of writing as exports from some Curtis Island plants struggled. However, we do not expect that

negative difference to translate into full month-on-month results.

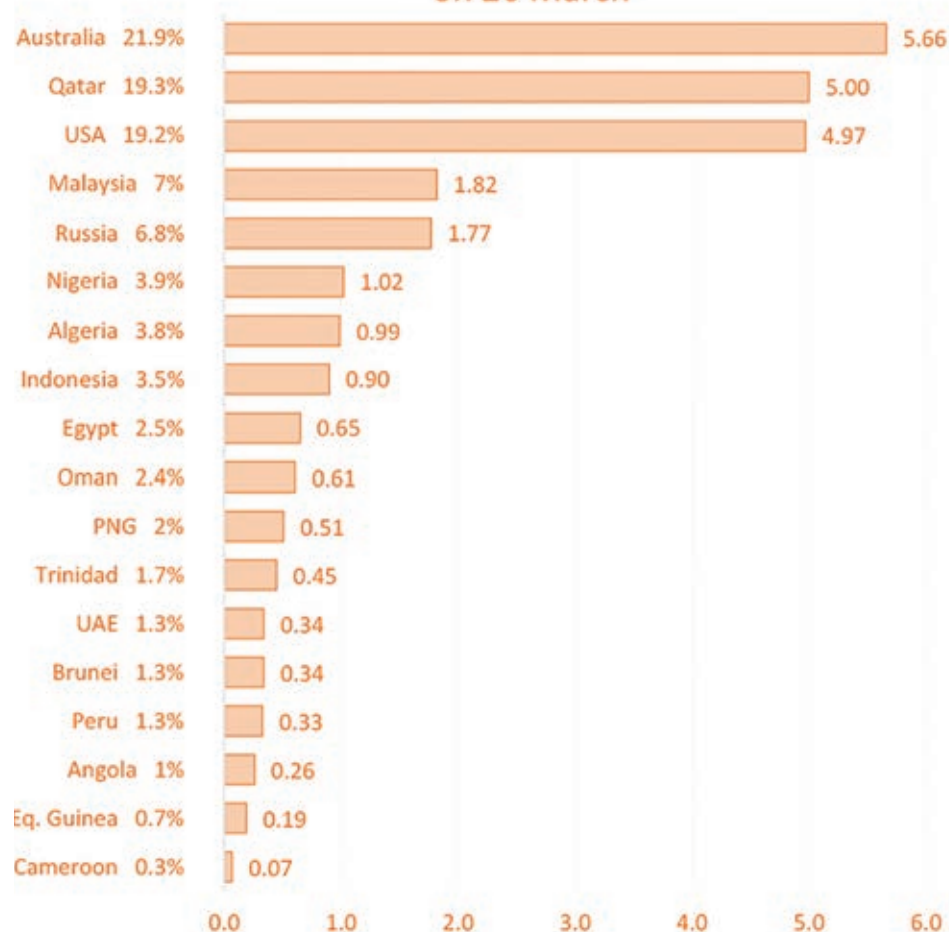
Preliminary figures suggest exports from Queensland Curtis LNG in particular are likely to have decreased significantly by the end of March as they were down by 0.27mmt (-38 percent) from the 0.71mmt recorded on 26 February. This was followed by Gladstone LNG, which saw exports decrease by 0.17mmt (-31 percent) to 0.38mmt. Meanwhile, Pluto LNG saw broadly steady exports of 0.34mmt at the time of writing, leaving sufficient headroom to finish the month with export growth.

Elsewhere
in

Preliminary figures suggest monthly exports from QCLNG in particular are likely to have decreased in March

Australia,

Market Share & LNG Exports by Country (MMt)
on 26 March



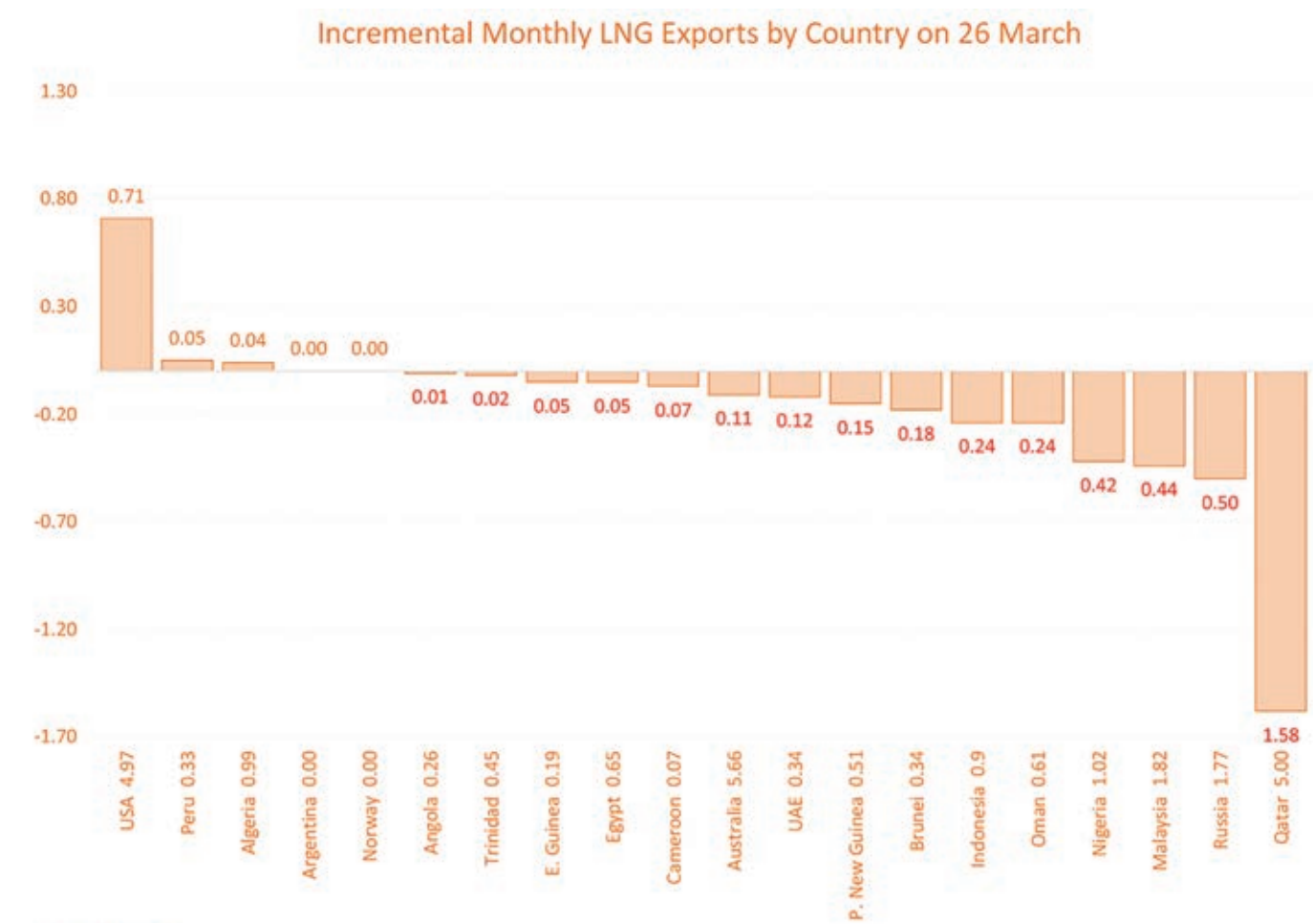
Source: LNG Journal

however, plants had already seen significant gains over February, with Gorgon LNG in the lead with 0.26mmt, up 31 percent over the 0.83mmt seen in February. Ichthys LNG had also improved shipments considerably by 0.18mmt (38 percent) to 0.66mmt whilst Darwin LNG and Australia Pacific LNG had grown exports more modestly by 0.09mmt overall at the time of writing.

In western Australia – namely NWS LNG and Wheatstone LNG – exports had also grown by 0.12mmt (13 percent) and 0.07mmt (12 percent) already at the time of writing. As to unconventional LNG production, Shell’s Prelude FLNG barge was seen again in the market with exports totalling 0.15mmt and had thus kept month-on-month exports steady. Our data did not indicate another export from the floating facility before month-end. Taken together, this indicates to us the final result for Australia's March exports this year is likely to overcome the net month-on-month decrease of 0.11mmt seen at the time of writing.

North of Australia, however, Papua New Guinea’s PNG LNG saw month-on-month shipments decrease more drastically by 0.15mmt (-23 percent) to 0.51mmt on two fewer cargo shipments over the report period compared to its equivalent in February.

In neighbouring Indonesia, the amount of LNG shipped had also plummeted month-on-month, decreasing by 0.24mmt (-21 percent) to 0.90mmt from 1.14mmt recorded during the first 26 days in February. Meanwhile, Malaysia saw



Source: LNG Journal

monthly exports slump similarly by 0.44mmt (-19 percent) at the time of writing. In Brunei, LNG exports had fallen by 0.18mmt (-35 percent) to 0.34mmt.

Elsewhere in the Pacific, Russia’s Sakhalin-2 LNG had also seen exports decrease month-on-month due to ongoing maintenance as of 26 March. The plant had slashed shipments by 0.30mmt (-36 percent) to 0.53mmt from 0.83mmt in the equivalent period in February. In contrast, Peru’s Pampa Melchorita plant

had increased exports robustly by 0.04mmt (18 percent) to 0.33mmt in March from 0.28mmt in February.

Atlantic Basin

The Atlantic Basin’s overall shipped LNG had increased significantly by 0.61mmt (7 percent) month-on-month to 9.19mmt on 26 March. This led to an increase in export capacity utilisation by 4pp to 62 percent.

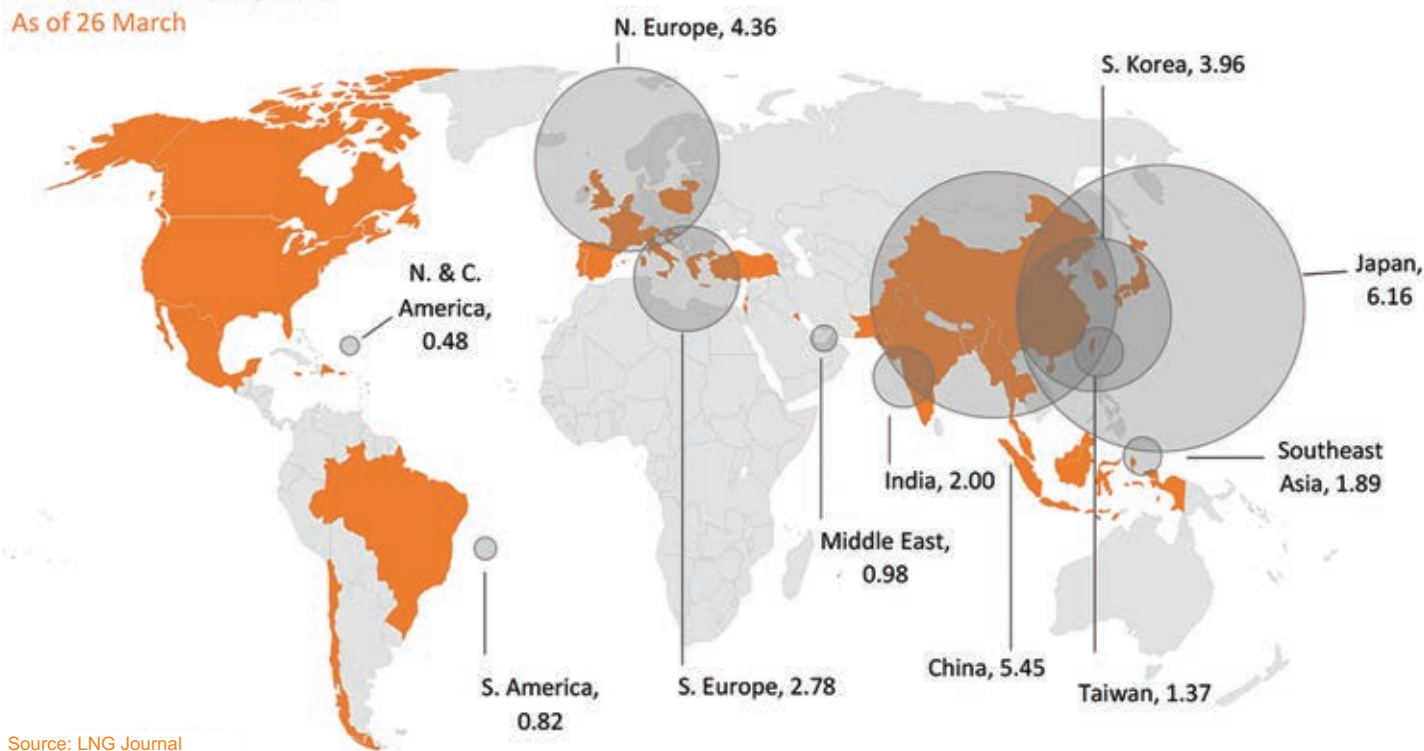
The overall amount of LNG exported within the eastern part of the Atlantic

Basin – comprising Europe, Russia and Africa (and not including re-exports) – had seen a net decrease of 0.34mmt (-8 percent) month-on-month on 26 March. The ongoing outage at Snøhvit LNG in Norway still weighed exports from the Atlantic Basin's eastern half, as did a significant month-on-month reduction of 0.28mmt (-22 percent) at Nigeria’s Bonny Island LNG. Whilst in theory there was enough time until the end of March for the Nigerian difference to be balanced, we were not optimistic for positive month-on-month growth by the end of March considering visible scheduled vessel calls.

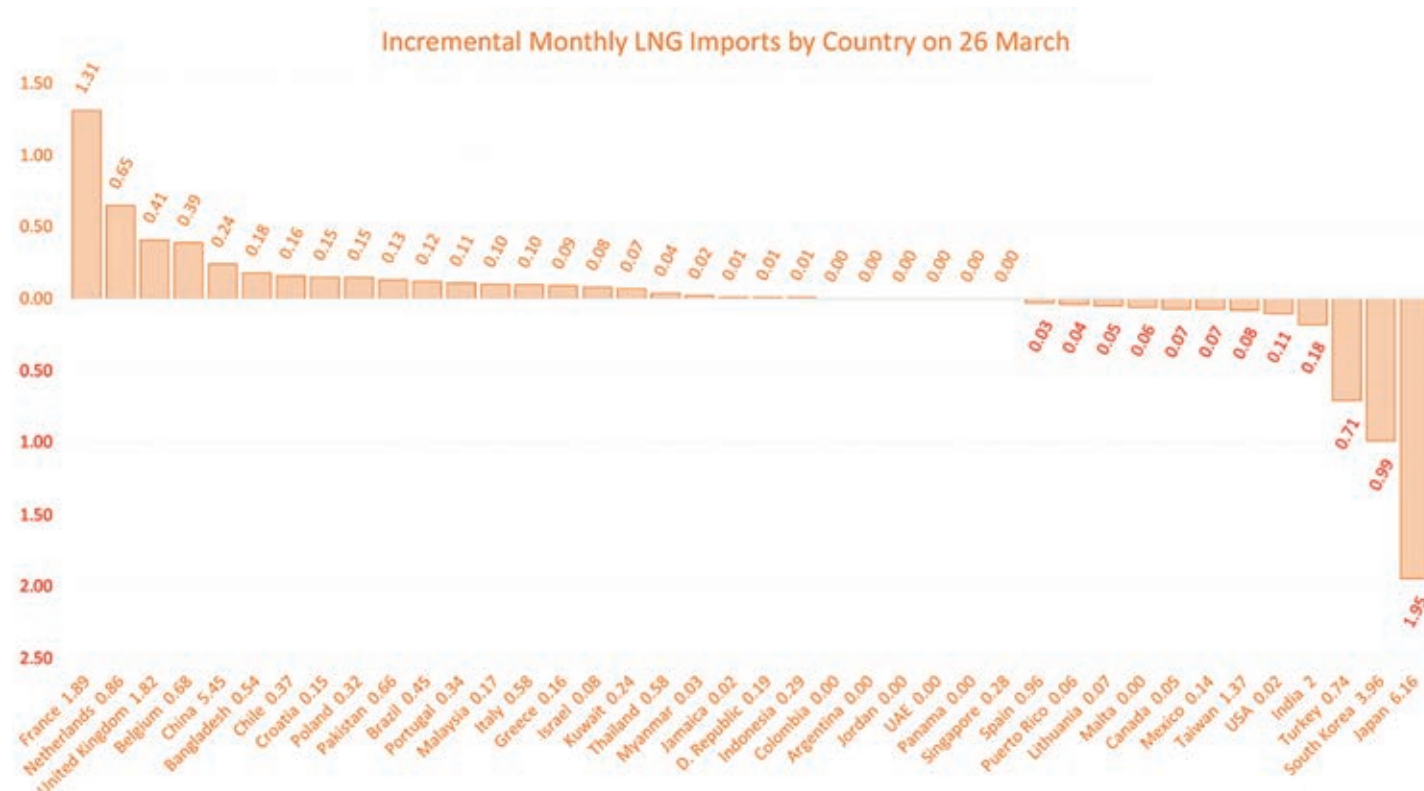
Accordingly, the Atlantic’s likely net LNG export growth in March was set to have been driven by the United States. Overall US shipments had already increased robustly by 0.91mmt (-22 percent) to 4.97mmt in March compared to the 4.06mmt recorded for the same period in February. Market visibility at the time of writing indicated export growth was underpinned by an almost doubling in Far Eastern demand for US LNG. Month-on-month exports broadly destined for the Far East had expanded from 0.77mmt in February to 1.52mmt by 26 March, according to our market visibility. Whilst we highlight that there remains potential for these numbers to change (e.g. due to diversions), we expect the overall growth trend to have held by the end of the month.

Global LNG Imports

As of 26 March



Source: LNG Journal



Source: LNG Journal

In South America, Atlantic LNG in Trinidad & Tobago had also continued to increase monthly exports, reaching 0.45mmt on 26 March, up 0.04mmt (10 percent) from 0.41mmt on 26 February. Atlantic LNG shipments pivoted from the Caribbean and North America to Europe, where demand was set to have seen a significant demand upswing over February.

Middle East

In contrast to Atlantic Basin producers, shipments from Middle Eastern plants in March to date had decreased by 1.31mmt (-17 percent) from 7.72mmt for the equivalent period in February. The reduction was underpinned by a slashing in shipments by Qatar. Meanwhile, the country's fellow regional producers in Oman, the UAE and Egypt also did not keep month-on-month growth apace, curtailing exports by 0.16mmt (-21 percent) and 0.06mmt (-15 percent), respectively. This only left Egypt to facilitate some export growth through the newly restarted Damietta plant, which had ramped up shipments by 0.12mmt (171 percent) month-on-month on 26 March. However, Idku LNG did not follow suit and had curbed shipments by 0.10mmt (-18 percent) to 0.46mmt at the time of writing.

We highlight that due to the protracted blockage of the Suez Canal that was caused by the container ship Ever Given, we think it unlikely that Egypt will be

able to significantly improve on the net monthly increase of 0.08mmt we expect to see for the whole month of March. Qatar is also affected by the Suez blockage. Our data pointed to the Q-Max vessels Al Mafyar and Al Samriya being rerouted away from Suez and around the Cape of Good Hope. Accordingly, we see the Basin's utilisation of operational export capacity (i.e., excluding Yemen) to remain significantly below the full utilisation recorded during previous months and possibly come in below 90 percent for the first time in the past 12 months.

Imports & Domestic Trade

Global LNG demand was determined by the Pacific Basin, where month-on-month imports are likely to decrease by 2.60mmt (-11 percent) to 21.12mmt in March. This was contrasted by a significant demand increase in the Atlantic Basin (with some notable exceptions) and the first signs of seasonal demand growth in the Middle East, where offtakes are likely to have grown by at least 0.28mmt (40 percent) to 0.90mmt, our data suggested

on 26 March.

Pacific Basin

Month-on-month Pacific Basin imports are likely to have decreased by 2.60mmt

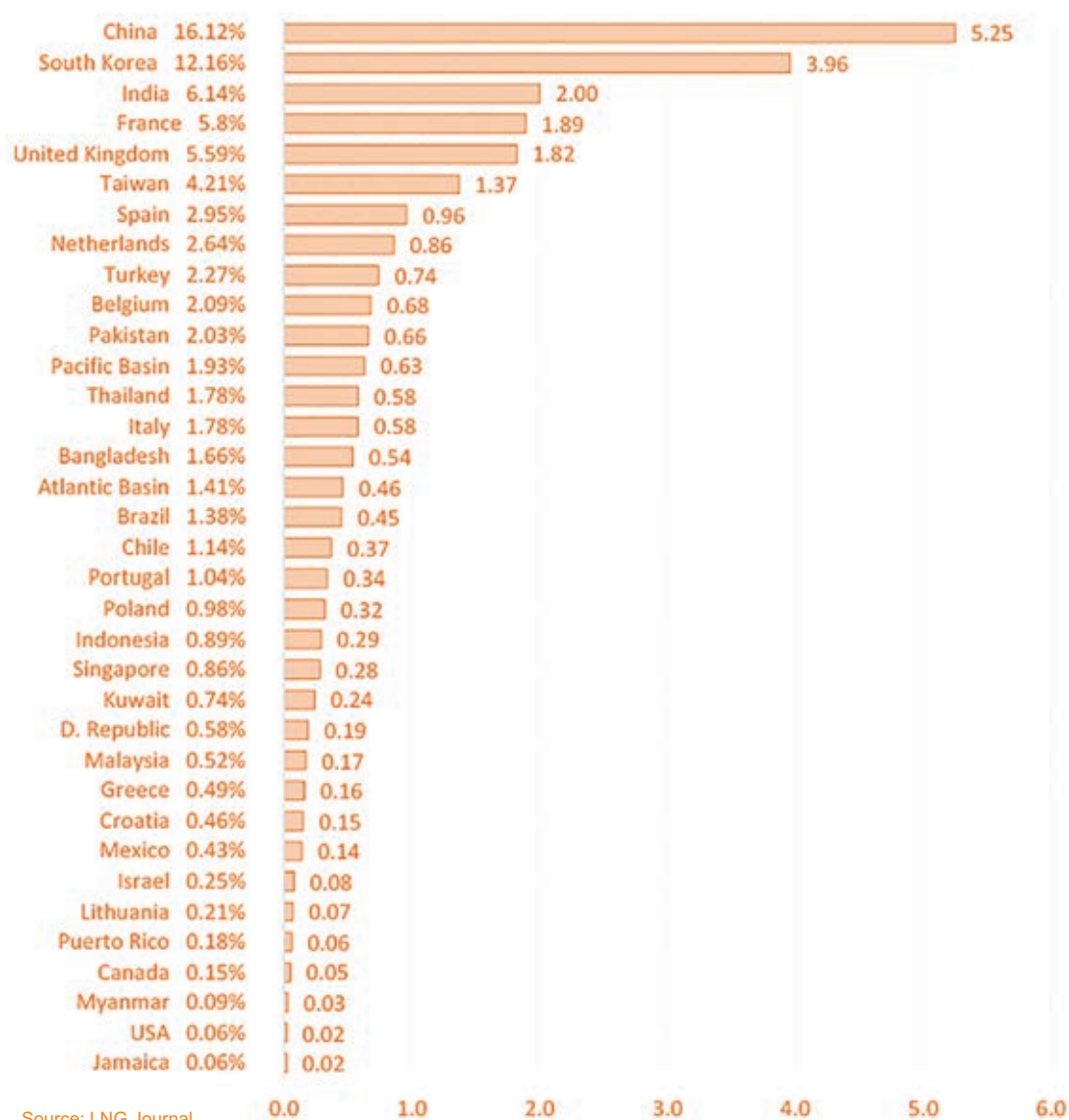
on 31 March as some of the Basin's largest importers – Japan, South Korea and Taiwan – were set to slash offtakes by almost 2.70mmt, our data indicated on 26 March. At the time of writing, we were expecting only nine additional cargoes without declared destinations within the Far East and amounting to 0.63mmt, to make landfall by 31 March.

Pacific offtake reductions are likely to be led by Japan, which was looking to cut LNG imports by 1.95mmt (-24 percent) to 6.16mmt, according to visible cargoes at the time of writing. This was followed by South Korea with a likely reduction of 0.99mmt (-20 percent) month-on-month to 3.96mmt and Taiwan with 0.08mmt (-6 percent) to 1.37mmt. India was also looking to decrease offtakes by 0.18mmt (-8 percent) to 2.0mmt.

In Southeast Asia, however, Indonesia was likely to see demand increase by 0.01mmt (4 percent) to 0.29mmt whilst neighbouring Malaysia was also likely grow domestic offtakes by 0.10mmt (48 percent) to 0.07mmt.

Moreover, the roster of typically price-conscious Pacific buyers – including Bangladesh, Thailand, Chile, Mexico, Singapore and Myanmar – are

Market Share & LNG Imports by Country (MMt) on 26 March



Source: LNG Journal

collectively likely to boost imports by 0.33mmt in March, our data indicates. This was primarily due to Bangladesh having imported 0.18mmt more by 31 March, followed by Chile with 0.16mmt more. Accordingly, we expect the two countries to have imported around 0.54mmt and 0.37mmt, respectively, by the end of the month. Thailand and Myanmar were also expected to have increased imports by 0.06mmt in total, judging by our delivery outlook on 26 March. These anticipated increments,

however, are likely to have been tempered by flattish imports of 0.28mmt in Singapore and a notable month-on-month reduction of 0.07mmt (-33 percent) to 0.14mmt in Mexico.

Atlantic Basin

In contrast to their Pacific equivalents, LNG imports in the Atlantic Basin were set to increase significantly. At the time of writing, our market visibility indicated net Atlantic demand growth of 2.31mmt (33 percent) to 9.36mmt from

7.05mmt in February, which would peg overall capacity utilisation at 42 percent.

The Atlantic Basin's offtake increase is likely to have been driven by net European demand growth of 2.51mmt (41 percent) month-on-month in March. The reader may recall the LNG Journal previously reporting on a significant January swing of LNG supply away from Europe and towards the Far East. Our data indicates this pendulum is now swinging the other direction.

European demand was underpinned

by France, the Netherlands and the United Kingdom, which together are likely to have boosted imports by around 2.37mmt by the end of the month. Additionally, Belgium, Croatia, Poland and Portugal are also expected to have imported 0.80mmt more overall compared to February, whilst Italy and Greece are going to show more moderate increments totalling 0.19mmt, according to our data outlook. These expected increments are therefore more than capable offsetting a significant monthly LNG demand reduction in Turkey, which we peg at roughly 0.71mmt (-49 percent) by the end of March, as well as more minor reductions in Spain, Lithuania and Malta totalling 0.14mmt.

As to demand in the western Atlantic, importers in the Caribbean and South America – including Brazil, Jamaica, Puerto Rico, the Dominican Republic, the United States and Canada – are set to have seen monthly net LNG demand decrease by around 0.21mmt (-21 percent) overall in March and are thus likely to accelerate offtake reductions significantly from the month-on-month demand decrease of 4 percent seen in February. The bulk of the expected month-on-month reduction in March is due to be seen in North America as the United States and Canada together are expected to slash imports by 0.18mmt (-71 percent) in line with the onset of spring.

Middle East

We are also expecting Middle Eastern offtakes to have increased significantly by the end of March. Our market visibility at the time of writing indicated regional imports to have grown by 0.28mmt (40 percent) to 0.98mmt by 31 March, although the majority of that growth was likely to be limited to the Persian Gulf region. In line with the change in season and resulting warmer weather – temperatures in Kuwait and Pakistan were forecast to reach 30°C before the end of March – the Persian Gulf region is expected to have increased LNG imports by 0.20mmt. Additionally, the FSRU stationed off Israel's Hadera port also received a BP-delivered cargo of 0.08mmt in March.

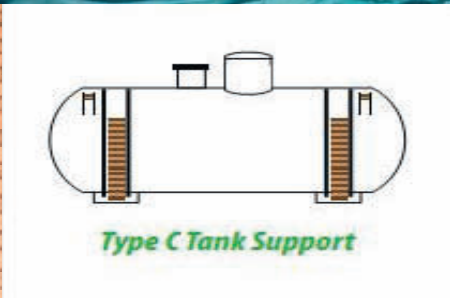
Nevertheless, we were still not expecting the UAE nor Jordan to import LNG before 31 March at the time of writing. Since its re-emergence as a prominent Middle Eastern LNG exporter, Egypt was also not expected to take in LNG in March before 31 March. ■



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For the Record

ADNOC LNG, a subsidiary of the Abu Dhabi National Oil Company, has awarded the front-end engineering and design contract for the rejuvenation of two liquefaction Trains at the Das Island export plant in the Arab Gulf to Australian firm Worley Engineering Pty. Ltd. The LNG Trains are an essential part of the Das Island resources centre for storage and export operations for oil and gas extracted from the offshore fields of Abu Dhabi in the United Arab Emirates. The rejuvenation will allow ADNOC LNG to extend the life cycle of Trains 1 and 2 at the facility, enhancing efficiencies through the replacement and maintenance of key operational elements within the LNG processing units.

The scope also includes underground piping, major machinery and sea-water intake. The two Trains account for more than half of ADNOC LNG's current production capacity. "This award further highlights ADNOC LNG's drive to invest responsibly and unlock greater value from our assets and resources," explained Ms Fatema Al Nuaimi, Chief Executive of ADNOC LNG. "The rejuvenation of these two Trains will ensure the resilience, reliability and safety of our operations, and reinforces ADNOC LNG's commitment to its customers as we continue to work towards our long-term strategy," stated Al Nuaimi. The Managing Director of Worley in the UAE, Amru Alabidi, said he was delighted to have received the contract for the Australian firm, whose global headquarters are in North Sydney in New South Wales. "Worley is proud to have been selected to support ADNOC LNG with this important project," declared Alabidi.

ADNOC LNG added that the FEED contract was the first of a two-step award. "Once FEED work is complete, an engineering, procurement, and construction (EPC) contract award will follow, dependent on the results of the FEED study," said ADNOC LNG. The Das Island plant produces about 6 million tonnes per annum of LNG at its facilities, which first came on stream in 1977, making the plant the oldest in the Arab world after Algeria's Arzew plant. ADNOC LNG said the Das Island

rejuvenation project was one of multiple capital projects that the company was undertaking over the next three years to further upgrade its production assets and "maintain its longstanding position as a reliable and responsible" global energy supplier.

ALGERIA, through Minister of Energy and Mines Mohamed Arkab, said at a meeting of 15 African energy-producing nations, six of them LNG exporters, that they should unite to find solutions to multiple challenges facing the hydrocarbon sector, in particular the energy transition and the lack of funding for fossil fuel projects. Algeria has two LNG plants at Arzew and Skidda, while other LNG countries at the virtual-conference included Nigeria, Egypt, Angola, Cameroon and Equatorial Guinea. Arkab made the opening address to the extraordinary meeting of the Council of Ministers of the African Organization of Petroleum Producing Countries (APPO) at a time when the continent's oil and gas companies are under extreme pressure.

The Algerian Minister noted that African oil and gas-producing countries are seeing an accelerating energy transition, while international funding was moving towards investments in fields other than hydrocarbons. "In addition, the laws and directives adopted in many countries impose restrictions and financial penalties on the use of fossil fuels," said Arkab. "All these changes and new trends are occurring at a time when our countries are unfortunately still very dependent on income from fossil fuels for the financing of economic and social development," stated the Minister. Referring to the impact of the Covid-19 pandemic which he said had caused a "shock" in African economies and energy systems, Arkab said worse was to come. "Some of the world's major multilateral financial institutions like the World Bank and private financial institutions have publicly announced their intention to end lending for fossil fuel projects," he stated.

Arkab recalled that the Paris agreement on climate change, signed in 2015, aimed to end the use of hydrocarbons by 2050, hence the need for member countries to "find a balance between the evolution of the world and the particular challenges" facing the African continent. "African countries risk having fixed assets and not being able to sell their resources to the outside world, nor to use them fully for their own needs,"

stated the Algerian Minister. To this end, Arkab urged the members to make a joint and united effort to consolidate cooperation in the field of hydrocarbons, improve access to energy as well as to try and diversify their economies. This was the 40th meeting of the Council of Ministers of APPO and Algeria is the chairman of the body for 2021. Created in 1987, APPO's other members are oil and gas producers Benin, Congo, Côte d'Ivoire, Gabon, Niger, Chad, the Democratic Republic of Congo, Libya and South Africa. There are also three observer countries, Sudan and Ghana, a new LNG importer, and Mauritania, which is a participant in floating LNG projects currently underway off West Africa.

ANNOVA LNG, the medium-scale US project planned for the south bank of the Brownsville Ship Channel in Texas, will not now be proceeding following a decision by investors to cancel the venture. The Annova project was expected to ship almost 7 million tonnes per annum from a proposed liquefaction plant as part of the second wave build-out for Gulf Coast exports. The joint venture proposed the construction of six small-scale liquefaction Trains as well as an interconnected pipeline and marine export facilities. Annova had been backed by Chicago-based utility Exelon Corp. and included midstream operator Enbridge, engineering firm Black & Veatch and US construction contractor Kiewit Corp.

The Annova LNG company said the decision was the result of changes in the global LNG market. One of three liquefaction projects proposed to be built along the Brownsville Ship Channel, Annova had yet to announce any firm long-term contracts tied to supply from the plant and was delaying a final investment decision. "The entire Annova team is very grateful to the greater Brownsville community for having supported this project for several years," said a statement from Annova LNG. There are also two other Brownsville Ship Channel projects, NextDecade's Rio Grande venture with 27 MPTA of planned output and Glenfarne Group's Texas LNG with 2 MTPA of proposed production and they have yet to declare their FIDs.

Annova had received its final permits to begin construction. Annova's strategy was to offer volumes to mid-scale customers who were seeking to buy increments of 1.0 MTPA but there were no contracts signed. Annova had received

key federal authorizations, including its FERC certificate and Department of Energy approval to export its full capacity to both Free Trade Agreement and non-Free Trade Agreement nations. Annova also signed an accord in January 2020 to arrange feed-gas deliveries from the Agua Dulce hub in Texas. Its agreement with Enbridge Inc. affiliate, the Valley Crossing Pipeline, would have provided transportation for its total feed-gas requirements.

ATLANTIC GULF and Pacific (AG&P), the Singapore-based LNG and natural gas logistics and distribution company, has been issued with a Notice to Proceed (NTP) by the Department of Energy in the Philippines for the development of its own LNG import and regasification terminal in Batangas Bay on the Filipino main island of Luzon. The project is called Philippines LNG and will store and dispatch LNG to power plants, industrial and commercial customers and other consumers. PLNG will have initial capacity to deliver up to 3.0 million tonnes per annum of LNG by 2022, with additional capacity for distribution in the liquid fuel market.

The PLNG venture is a rival project to another being developed in Batangas Bay by First Gen Corp., the largest provider of gas-fired power in the Philippines. First Gen's Batangas project is developing a fast-track terminal to also bring LNG to the Philippines by 2022 at Batangas City. Analysts note that the need for the Philippines to import LNG to the Batangas region and elsewhere has stemmed from efforts to shore up the country's energy security for the capital Manila with the expected depletion of the Malampaya gas field, currently the sole provider of domestic supplies for Luzon. PLNG will also have scalable onshore regasification capacity of 420 million standard cubic feet per day and almost 200,000 cubic metres capacity of storage that will ensure high availability and reliability of natural gas for its customers.

AG&P has already completed its pre-development work for PLNG, which is expected to be commissioned by mid-2022. "We are excited about this critical step in bringing AG&P's Philippines LNG import terminal online," said Karthik Sathyamoorthy, President of LNG Terminals and Logistics at AG&P. "AG&P is working to bring this safe, environmentally-friendly, competitive fuel to our customers by the summer of 2022 and hope that the wide availability of

natural gas will spur manufacturing and jobs in the Philippines,” added Sathyamoorthy. The government’s approval of AG&P’s application is in line with its aim of making the Philippines a regional LNG hub in Southeast Asia to rival Singapore. “The Philippines LNG Terminal is a landmark development for the country that will accelerate industrialization, create jobs, lower pollution and trigger overall economic and social progress. It will directly and indirectly improve the quality of life for many thousands of Filipinos,” stated Sathyamoorthy.

BALTIC EXCHANGE has started issuing independent indices for liquified natural gas propulsion fuel, based on vessels burning LNG rather than marine fuel oil or marine gas oil as their primary fuel. The London-based Exchange, owned by the Singapore Exchange, makes its latest offering following benchmarking that also covers other aspects of the LNG shipping industry. Published twice weekly, the new indices have been given the acronym (BLNGg) and will be published alongside the current LNG indices which are based on LNG carriers burning Very Low Sulphur Fuel Oil (VLSFO). Historical data for the new indices will be available dating back to 1 January 2020. The standard Baltic vessel has the following speed and consumption specification when burning LNG as a fuel: 17 knots on 210 cbm LNG/day laden; 16 knots on 190 cbm LNG/day ballast 0.1 percent boil off; Port consumption 42 cbm LNG/day idle; Port consumption 85 cbm LNG/day working.

US dollar per day assessments are also available on the following routes: BLNG1g Australia to Japan return voyage (RV); BLNG2g US Gulf to Continent RV; BLNG3g US Gulf to Japan RV. US derivatives trading platform company, Chicago-based CME Group, plans to launch three new futures contracts based on the new Baltic Exchange indices on 22 March, 2021, pending regulatory review. “As LNG markets continue to evolve globally, demand for new tools to manage the risk around its transportation is also growing rapidly,” said Peter Keavey, Global Head of Energy at CME. “The introduction of contracts based on the usage of LNG as bunker fuel among global shipping routes is the next step in the evolution of freight and provides another market-based solution to help our customers to manage their global gas risk,” he added. Since the

introduction of the 2020 global sulphur cap by the International Maritime Organization, the majority of LNG carriers have switched to LNG boil-off gas rather than burn low-sulphur fuel oil, marine gas oil or install emissions abatement technology. The boil-off process allows the naturally evaporating LNG cargo to be sent to the engine room and burned by the main boilers as fuel. The Baltic Exchange was acquired in 2016 by the Singapore Exchange and from then started looking for new areas to develop such as introducing more LNG shipping indices.

BW OFFSHORE, the Norway-listed floating production units provider for oil and gas, has been awarded an Australian contract worth US\$4.6Bln by LNG operator Santos for the Barossa gas field to provide feed-gas for the Darwin liquefaction plant. BW Offshore will supply the Floating Production Storage and Offloading (FPSO) unit to be deployed at the Barossa gas field, located 300 kilometres offshore Darwin in Australia’s Northern Territory. The contract is subject to a Final Investment Decision (FID) by Santos and its partners, due in several weeks. The FPSO contract is on a lease and operate basis for a firm period of 15 years, with 10 years of options. Santos Chief Executive Kevin Gallagher regards the contract with BW Offshore as a bargain for the Adelaide-based company to provide back-fill for Darwin LNG. “The decision to proceed with an FPSO services contract maintains a low ongoing operating cost while engineering enhancements have significantly reduced the project’s carbon footprint,” said Gallagher. “This reduction in capital expenditure makes Barossa one of the lowest cost of supply projects in the world for LNG and will provide new supply into a tightening LNG market,” added the Santos CEO.

The FPSO will be built in South Korea and Singapore before being towed and permanently located over the field where it will process natural gas prior to its transport via pipeline to Darwin LNG. Condensate will be stored on the FPSO for periodic offloading. Barossa will provide the next source of gas for the existing Santos-operated Darwin LNG plant once current reserves from the Santos-operated Bayu-Undan gas field in the Timor Sea have been depleted. Gallagher said the awarding of this contract builds on the momentum of the Barossa project over the past six months

ahead of the FID. “At the end of last year, we announced that transport and processing agreements had been finalised for Barossa gas to be tolled through Darwin LNG and we signed a long-term LNG sales agreement with Diamond Gas International, a wholly-owned subsidiary of Japan’s Mitsubishi Corp.,” the Santos CEO explained.

Santos currently holds a 62.5 percent operated interest in the Barossa joint venture along with its partner, South Korea’s SK E&S (37.5 percent). BW Offshore said the final price tag over the 15 years was US\$4.6Bln and the company would be responsible for engineering, procurement, construction, installation and operation of the FPSO. The topside weight will be around 35,000 tons and the FPSO will have processing capacity for up to 800 million standard cubic feet per day of gas and design capacity of 11,000 barrels per day of condensate.

BW Offshore said that the FPSO would be turret moored with a new-built hull based on BW Offshore’s RapidFramework design and initial gas production from the FPSO was expected during the first half of 2025. “This award confirms our ability to leverage extensive operational and development capabilities to win and execute offshore energy transition related projects,” said Marco Beenen, CEO of BW Offshore. “The Barossa FPSO represents a new type of infrastructure-like contract for BW Offshore with attractive long-term returns, supported by strong partnerships with equity co-investors and banks,” explained Beenen. “The project capital expenditure of around \$2Bln will be financed by banks and equity partners, in combination with BW Offshore, as well as approximately \$1Bln in total advance lease payments during the construction period,” he added. A syndicate of international project finance banks will provide 14-year debt financing during both construction and operation. BW Offshore and international infrastructure equity partners will contribute 51 percent and 49 percent of the project equity respectively. “Both the debt and equity agreements are well advanced,” stated BW Offshore.

COLUMBIA GULF Transmission, the natural gas pipeline along the US Gulf Coast, has received authorisation from the Federal Energy Regulatory Commission that will enable the supply of feed gas to the Venture Global Plaquemines LNG export plant being

built on the west bank of the Mississippi River. The FERC permit is for Columbia Gulf to construct and operate two new compressor stations, a new meter station and other facilities to provide 725 million standard cubic feet per day of feed gas for the Plaquemines liquefaction plant, located south of New Orleans. Columbia Gulf is owned by Canadian pipeline and infrastructure company TC Energy, whose Keystone XL oil pipeline was the first energy project cancelled by presidential decree when Joe Biden took office in January 2021 as President. The FERC said that its assessment was positive for Columbia Gulf’s East Lateral XPress Project and it did not see any adverse environmental effects. “The FERC staff concludes that approval of the proposed project, with appropriate mitigating measures, would not constitute a major federal action significantly affecting the quality of the human environment,” said the FERC ruling.

The East Lateral XPress Project is a small part of Columbia Gulf Transmission’s 3,400-mile pipeline that delivers natural gas to customers in Louisiana, Mississippi, Kentucky and Tennessee. Its transportation services also move gas from the Gulf of Mexico to other pipelines in southern Louisiana. The proposed East Lateral XPress Project includes 8.1 miles of 30-inch-diameter pipeline lateral within Balataria Bay at Plaquemines Parish in Louisiana, a 3,470-horsepower compressor station at an abandoned Columbia Gulf compressor station site in St. Mary Parish and another 23,470-HP compressor station adjacent to an existing tie-in facility in Lafourche Parish. All of these different small parts of the East Lateral Express project will open the way for firm feed-gas supplies for the Plaquemines export plant.

In addition to the Plaquemines plant being developed at river mile-marker 55 on the Mississippi, about 30 miles south of New Orleans, Venture Global is also building the Calcasieu Pass LNG plant in Louisiana, where half of the 18 mid-scale liquefaction Trains have already been completed. The area of Calcasieu Pass already plays host to the existing Cameron LNG plant, operated by Sempra Energy. Both Calcasieu Pass and Plaquemines are being constructed by Arlington, Virginia-based Venture Global with liquefaction and export capacity of 10 million tonnes per annum and with the same number of 18 modular Trains.

Venture Global's Calcasieu Pass facility is also being constructed with its associated TransCameron Pipeline. The company is at the same time studying other LNG export opportunities in the state of Louisiana. The Calcasieu Pass plant has Omaha, Nebraska-based company Kiewit Corp. as the engineering, procurement and construction contractor. Venture Global stated in December 2020 that US engineering firm KBR was awarded the EPC contract for the first phase of the Plaquemines project.

ENN GROUP, the leading non-state energy company in China with LNG and city-gas assets, reported an increase in annual revenues and profits as its reach extended to 18 more large towns and cities in 2020. ENN said annual revenues increased by 2 percent to 71.6 billion Chinese yuan (\$11Bln) from mainly natural gas operations, though it has a growing integrated power business. The company, whose shares are listed on the Hong Kong stock exchange, said profits for the year attributable to shareholders rose 10.7 percent to 6.27 Bln yuan (\$964 million) from 5.67Bln yuan (\$870M) in 2019. ENN said that among its operational highlights it increased its city-gas projects in China by 18 to a total of 235 during 2020.

The company noted that most of the group's projects are located in key areas of air pollution prevention such as Beijing, Tianjin and Hebei in the northeast, Shandong, Jiangsu, Zhejiang in the East and in the southern province of Guangdong. ENN owns the Zhoushan LNG import terminal in the Zhejiang Free Trade Zone in eastern China and is planning to launch an expansion in 2021 from 3 million tonnes per annum to 5 MTPA. ENN will double its LNG storage by adding two more tanks, each with capacity of 160,000 cubic metres. In line with energy industry liberalization in China during 2020, ENN gave third-party access for the first time, allowing the provincial government-owned company, Zhejiang Energy, to receive its LNG cargoes at Zhoushan. The earnings statement showed that total gas sales volumes of ENN and its affiliates and joint ventures grew by 9.7 percent year-on-year to 29.56 billion cubic metres.

ENN said that during the year, natural gas supply was adequate and upstream natural gas and city-gate prices were reduced. "At the same time, the Group increased low-cost LNG imports through our own long-term contracts and from

spot market utilization through the Zhoushan terminal, which effectively optimised the gas supply structure and reduced overall gas procurement costs during the year," ENN explained. ENN said that leveraging on the opportunity of the air pollution control battle, the Group has further explored business opportunities in renewables and clean power and promoted the replacement of coal-fired boilers with natural gas. It added that national and local government continued to promote policies on energy structure optimisation, energy conservation and emissions reduction, as well as increasing the use of clean energy. ENN said the pipeline gas penetration rate increased 1.6 percent during the year to 62 percent from 60.4 percent in 2019. "The global outbreak of Covid-19 disrupted economic activities and caused recessions in various countries in 2020," said ENN. "Nevertheless, China's economic activities, especially industrial production, have been resumed in an orderly manner since the second quarter of the year with its effective pandemic prevention and control measures," it added.

EXCELERATE Energy, the experienced US floating liquefied natural gas import project company, has signed an accord with the European Balkans country of Albania to study the potential of LNG imports and backed by ExxonMobil Corp. Albania is now in accession talks with the European Union after previously being known as the North Korea of Europe until 1985 under the dictator Enver Hoxa. The memorandum of understanding with Excelerate and ExxonMobil will study the feasibility of an LNG import terminal at the Port of Vlora in southern Albania. Under the accord, Excelerate will conduct a study to explore the potential of an integrated LNG-for-power solution for the Albanians.

This will include developing an LNG import terminal, converting or expanding the existing Vlora thermal power plant and establishing small-scale LNG distribution in Albania and for the surrounding Balkans region. The pre-feasibility report is expected to be delivered in the third quarter of 2021, while the targeted start-up for the LNG terminal could be as early as 2023. "As Albania looks to improve energy security and resiliency, we are confident that an LNG solution would provide reliability to the country's power grid while

complementing intermittent renewables and alternative resources," stated Steven Kobos, President and Chief Executive of Excelerate. "We are pleased to work with our partners in developing a reliable and affordable solution for Albania's energy resilience," stated Kobos. Albania is traversed by eight major river systems and has previously relied on hydropower plants, which can become unreliable during times of drought in supplying electricity. "LNG would bring reliable, affordable and cleaner energy to the region and complement Albania's hydropower-based electricity production," Excelerate noted. Excelerate has delivered reliable and clean energy to markets across the world with 13 FSRU LNG import projects.

The Vlora joint venture would have emphasis on greater integration of services to serve gas and power customers. "Supply diversification and the enhancement of supply security are crucial to Albania and to our Balkan neighbours as well," said Albanian Minister of Infrastructure and Energy Belinda Balluku. "We are confident that LNG can be the key to achieving these strategic objectives and to finally provide a solution to the complex Vlora thermal power plant project by choosing the best partners and equipped to deliver a project of such magnitude," she added. As part of the project study, ExxonMobil would identify opportunities to support the supply of LNG into Albania and the LNG terminal as a project of National Strategic Importance. "LNG enables transportation of natural gas from supply centers to customers safely and cost effectively," said Ed Austin, ExxonMobil LNG Strategy and Portfolio Manager. "While we are at the early stages of exploring this opportunity, ExxonMobil's global resources and reliable LNG supply chain can help Albania meet its fast-growing demand for natural gas and ensure long-term supply security," stated Austin.

FLUXYS, the Belgian natural gas grid company and owner of the Zeebrugge LNG import terminal, has agreed to become a partner and operator for the Hanseatic Energy Hub, the latest German LNG import terminal project to be developed west of the port of Hamburg. Fluxys will be an industrial partner in Hanseatic Energy whose other additional investor is the Partners Group, a Swiss-listed private asset management firm. Under the development plan, the new German terminal will be located on the

Elbe River, about 45 kilometres (28 miles) from Hamburg and be operational by 2026 with capacity of around 8.5 million tonnes per annum of LNG. The LNG joint venture project is in the port of Stade in the German state of Lower Saxony. The project name recalls Stade's membership of the 13th-century Hanseatic League, a commercial and defensive confederation of towns in Northwest Germany and Europe that dominated regional trade for several hundred years.

The terminal will also have facilities for reloading of LNG carriers, supplying river barges for bunkering as well as truck and rail loading capability. "The LNG terminal project will provide the largest gas market in Europe with an additional entry point by complementing an existing industrial cluster in Stade," said Fluxys. "The facility is to offer substantial send-out capacity of natural gas and unlock LNG as alternative fuel in shipping and heavy-duty transport as well," added the Belgian company. "The project is an opportunity for Fluxys to deliver on its growth ambition in Europe by strengthening and diversifying its infrastructure presence in Germany," stated Fluxys.

Fluxys operates the high-pressure natural gas transmission network in Belgium as well as natural gas storage infrastructure. The Belgian company's other assets include a stake in the Dunkirk LNG terminal in France. It is additionally a shareholder in the Trans-Adriatic Pipeline bringing Caspian Sea gas from the Turkish border through Greece, Albania and on to Italy. Manfred Schubert, Partner and Managing Director for Hanseatic Energy, said the company was pleased to have Fluxys on board. "We have been on the lookout for a world-class industrial partner to join the development and operate the terminal on a long-term basis, and we found that in Fluxys," explained Schubert.

The terminal's location is in a chemical industry cluster, also positioning it as a player in the development of low-carbon gases. "The Stade LNG terminal is set to be a key enabler of Germany's energy transition by creating an additional energy entry gate for LNG," said Pascal De Buck, Chief Executive Fluxys. "We look forward to joining our partners in the project and are keen to support the terminal's development with our industrial and commercial expertise," added De Buck.

GASUM, the Finnish state-owned LNG distribution company and regasification and liquefaction

infrastructure owner in the Nordic region, is expanding its geographic reach to France after already entering the Antwerp, Amsterdam and Rotterdam region, also known as the ARA area. “As part of this strategy, Gasum has now obtained a licence to deliver maritime LNG in France, allowing it to add French ports and waters to its supply network,” said Gasum. The new LNG distribution licence will allow Gasum to deliver to maritime customers in France and to offer LNG, a cleaner shipping fuel, to a larger number of customers.

In addition, the licence will improve the geographic availability of LNG to more European ports. “Obtaining this licence marks another milestone in our quest to increase the outreach of our maritime LNG deliveries,” said Jacob Granqvist, Vice President at Gasum. “It underlines Gasum’s commitment to act as a reliable European maritime LNG supplier,” added Granqvist. At the end of 2020, Gasum extended its bunkering activities to include the ARA area. The expansion is possible due to a new agreement with Norwegian oil and gas major Equinor for the ARA, an important trading hub in the rivers and canals and ports network where barges and small ships and tankers conduct trading and supply operations.

Gasum is now delivering LNG bunkering supplies to Equinor in the ARA. Gasum and Equinor have been co-operating on various projects and LNG supply chain development for Equinor’s vessels since 2011. The Finnish company has been fuelling Equinor’s oil tankers that are shipping crude oil from North Sea to Swedish and Baltic ports. The bunkering is mainly performed by Gasum’s small-scale bunkering vessels such as the “Coralus” and the “Kairos”. Gasum owns a network of LNG import terminals, a small-scale liquefaction plant and an expanding chain of LNG fuel stations for vehicles in the Nordic region. Its terminals include Sweden’s Nynashamn small-scale facility with 20,000 cubic metres capacity of storage and purchased in April 2020 by Gasum from Germany’s Linde AG. The Finnish company also has a small-scale liquefaction plant in Risavika, near Stavanger in Norway, in addition to owning and operating other small regasification and import terminals in Ora and Alesund in Norway and Lysekil in Sweden. It also partly owns the Pori LNG import terminal in Finland and has a stake in the Finnish Tornio Magna

regasification facility. The Tornio terminal in Northern Finland is the largest in the Nordic region. It is located on the Swedish border which allows it to serve Gasum’s customers in Finland, Sweden and Norway.

GTT, the French technology and engineering company for LNG storage, has signed an additional cooperation agreement related to the Tianjin Nangang LNG import terminal currently being developed in northeast China. GTT and the developer, Beijing Gas Group, said their accord is for collaboration for the phase II and phase III parts of the terminal construction beyond phase 1 covered by the current agreement. The second and third phases of the Tianjin Nangang construction will include building six additional storage tanks, each of 220,000 cubic metres capacity. This agreement was signed at a ceremony held at the French Embassy in Beijing in the presence of French Ambassador Laurent Bili, Chairman of Beijing Enterprises Group Tian Zhenqing and Li Yalan, Chairwoman of the board of Beijing Gas, along with Adnan Ezzarhouni, General Manager of GTT in China. “I am convinced that GTT, a company of excellence in the field of natural gas, has a great future in China, which has resolutely embarked on the path of energy transition,” state French Ambassador Bili.

The first firm agreement for Tianjin Nangang LNG followed a November 2019 accord between GTT and Beijing Gas on the occasion of the presidential visit to China of French President Emmanuel Macron for talks with his Chinese counterpart Xi Jinping. GTT subsequently received an order in June 2020 for the design of two 220,000 cubic metres capacity membrane tanks. Built as part of the Tianjin Nangang project, located east of the capital Beijing, these two tanks when completed will be the largest in China. “In this new agreement, GTT will also support Beijing Gas in upgrading the National Standards of LNG onshore tanks,” explained GTT. Beijing Gas Chairwoman Li Yalan said the Tianjin Nangang LNG project was progressing smoothly. “I hope Beijing Gas and GTT continue to strengthen their cooperation and jointly promote the adoption of the lower carbon footprint membrane full containment technology among Chinese gas companies,” added Li.

The Tianjin Nangang terminal will be the third serving the northeast Chinese

port supplying the gas needs of Beijing. The existing facilities currently include the Tianjin North onshore terminal operated by China Petroleum and Chemical Corp. (Sinopec) and a separate floating terminal provided by Norway’s Høegh LNG in the form of a floating storage and regasification unit on long-term charter to China National Offshore Oil Corp. (CNOOC). “We are very pleased to extend our partnership with Beijing Gas, proof that the membrane full containment technology meets expectations in terms of technological performance, cost competitiveness and level of safety,” stated Philippe Berterrotière, Chairman and Chief Executive of GTT.

HØGLUND GAS Solutions has signed a contract to provide a turnkey retrofit with LNG fuel capability for a Base Marine Norway-owned ship, the bulk and general carrier “Hannah Kristina”, which has US oil services company Halliburton as the end-charterer. “The project aims to improve the vessel’s environmental footprint by converting the marine diesel oil-fuelled vessel into dual-fuel by supplying an LNG Fuel Gas Supply System (FGSS) alongside an upgrade with shore power connection,” said Høglund. The project, led by Høglund, will require extensive collaboration between numerous stakeholders, including naval architects, engineering teams, a retrofit shipyard, various suppliers, the class society flag state and the vessel owners and operators. “Høglund will therefore collaborate with long-time partners HB Hunte Engineering GmbH and Fiskerstrand Verft AS for the naval architecture and shipyard elements of the project, respectively. The entire project will be classed by DNV,” explained the Norwegian company.

The scope under the contract consists of a 250 cubic metres capacity FGSS with a dedicated Gas Control and Safety System to serve the already installed dual-fuel system with natural gas. “In order to implement the appropriate safety measures following the requirements of the IGF-Code and improve the safety credentials of the ‘Hannah Kristina’, Høglund will be combining its extensive knowledge in gas, power and automation solutions with HB Hunte’s outstanding expertise in naval engineering to perform further modifications on the vessel,” the company explained. “These will include the adjustment of the mooring

arrangement in the LNG tank area and an upgrade to the ventilation system, among other conversions,” added Høglund. The delivery of the retrofitted vessel is expected to take place in March 2022. “The goal of this project is to upgrade a 20-year-old vessel with modern environmental credentials. With the use of LNG and battery power, the vessel will significantly reduce its carbon-dioxide and nitrogen oxides (NOx) emissions both while at sea and during harbour stays,” said Høglund.

Høglund said it would ensure that the complex stakeholder management aspect of the retrofit works will be run effectively and that this will result in a well-executed project. “The technological and environmental transformation of shipping over the coming years is one of the biggest challenges facing our industry,” said Philipp Ulrich, Senior Project Manager at Høglund. “To achieve this transformation in a commercially viable and minimally disruptive way, meaningful and well-coordinated collaborations are essential,” he added. Jean-Marc Lopez, Vice President of Halliburton in Norway, explained the reasoning for the move. “By utilizing ‘Hannah Kristina’, Halliburton has moved huge amounts of goods from road to sea, reducing the emission of CO2 and NOx,” he said. “With the conversion of ‘Hannah Kristina’ from diesel to LNG and shore power, we take the reduction of CO2 and NOx a step further, in line with our strategy to continue to reduce the environmental footprint of our activities,” declared Lopez.

ICE, the Intercontinental Exchange, said the LNG freight futures contracts based on Spark Commodities price assessments had a successful launch with 30 lots traded on the first day. First day trading included 15 lots of Spark30S Atlantic and 15 lots of Spark25S Pacific LNG freight futures contracts for the June 2021 contract expiry. ICE said these trades on March 22 involved some of the LNG industry’s leading market participants including Total, Gunvor, Vitol, and Glencore, and were brokered by Clarksons, showing strong support for the new contracts. ICE is introducing the new LNG freight futures based on price assessments from Spark Commodities, a provider of technology-based solutions for promoting market liquidity.

Singapore-based Spark is backed by French data firm Kpler and EEX, part of the Deutsche Börse Group. “These new

contracts - called the Spark30S Atlantic and the Spark25S Pacific LNG Freight Future contracts - are traded and settled in US dollars per day,” explained ICE. The numbers in the contract names indicate the number of days it takes an LNG carrier to complete a return voyage on the respective routes. The settlement price of the contracts are based on the Spark30S (Atlantic) and Spark25S (Pacific) LNG freight spot price assessments. “The unprecedented price volatility observed on the chartering market this year has underpinned the need for a derivative product allowing us to hedge the shipping capacity of our LNG portfolio and to position ourselves to benefit from arbitrage opportunities arising in the market,” said Patrick Dugas, Vice President of LNG Trading at Total Gas & Power. “The LNG Freight Future contracts on ICE provides us with the ability to more proactively manage our shipping exposure,” added Dugas.

Christian Greenop at brokers Clarksons said there was great demand to hedge LNG freight exposure. “We were happy to complete the first Spark30S Atlantic and Spark25S Pacific LNG Freight Futures trades on ICE and continue to work very hard in developing the LNG forward freight agreements (FFA) market,” declared Greenop. Gordon Bennett, Managing Director of Utility Markets at Atlanta, Georgia-based ICE, said the firm had received positive and supportive responses from the market. “The trades on the first day demonstrate the key role they will play in allowing participants to now manage freight risk alongside the commodity risk and therefore optimise their global natural gas portfolios,” added Bennett. ICE said the freight contracts would form part of its global natural gas complex as the market manages freight price risk alongside existing Dutch TTF, UK National Balancing Point, US Henry Hub, JKM LNG (Platts) and the West India Marker (WIM LNG) contracts from Platts.

JERA Co. Inc., the largest Japanese liquefied natural gas buyer with 35 million tonnes per annum of volumes and control of a fleet of 20 LNG carriers, has launched the environmental impact process for upgrading one of its key power plants at Chita in Aichi Prefecture. JERA is Japan’s biggest fossil-fuel generator being owned jointly by Tokyo Electric Power Co. and Chubu

Electric, the two largest power companies. The joint venture company currently operates and provides fuel for a total of 26 power plants in Japan and imports LNG into 11 of Japan’s network of 37 terminals.

JERA’s power plants have 70 gigawatts of capacity and the company is in the process of upgrading existing LNG and steam plants and also proposes to close its 2.2GW of coal-fired plants by 2030. The current project for Chita in the Chubu region, whose capital is Nagoya, is for the construction of new Units 7 and 8 at the plant which will use the most modern combined-cycle gas-fired plant technology to make more efficient use of LNG imports. The new gas-fired plants are expected to come on stream in August and December 2027. JERA is one of the world’s largest LNG buyers and traders, taking volumes from leading global liquefaction plants. In its plans for Chita, the older parts of the plants, units 1 to 5 with a combined 3,112 megawatts and using steam and LNG, are being decommissioned over the next few years through fiscal 2026.

The new Units 7 and 8 will then operate alongside the existing Unit 6 gas-fired re-powering plant, giving combined capacity of 2,154MW. “In order to reduce carbon-dioxide emissions, for new units 7 and 8 the plan adopts the latest high-efficiency combined-cycle power generation system (with gross thermal efficiency of approximately 63 percent),” said JERA. “In addition, the environmental burden due to smoke and warm wastewater is expected to be lower when the plan has been carried out than for operations at the existing facility,” stated JERA. JERA has submitted the Environmental Impact Assessment to Japan’s Minister of Economy, Trade and Industry (METI), the Governor of Aichi Prefecture, the Mayor of Chita City and the Mayor of Tokai City, in accordance with the Environmental Impact Assessment Law and Electricity Business Act.

JERA said the documents would be made available for public review at the administrative agencies listed above and public meetings in the relevant areas are scheduled for the 26th March, 2021. “People with opinions from an environmental conservation standpoint are invited to submit them via post or to drop them in boxes available at the public review locations,” explained JERA. “JERA will continue to move forward with the environmental impact

assessment process, giving due consideration to the opinions of other stakeholders,” it added.

KARMOL, the Turkish-Japanese joint venture, said its first floating storage regasification unit (FSRU) has been delivered by Sembcorp Marine in Singapore and will begin sea trials ahead of deployment in the West African state of Senegal in June. The FSRU, called “Karmol LNGT Powership Africa” will enable Karmol, a joint venture between Turkey’s Karpowership and shipping company Mitsui OSK Lines, to offer LNG-powered electricity to Senegal for the first time using its floating Powership, “Karadeniz Powership Aysegul Sultan”. In Senegal, Karpowership has been operating a 235MW capacity vessel with fuel oil and providing around 15 percent of the country’s electricity supply since August 2019. The first FSRU, operated by Karmol, will soon sail to the West African country and the Powership will switch to operating with LNG before the end of June.

This LNG-for-power project is advancing as Senegal and neighbour Mauritania pursue a floating LNG production venture with UK major BP and Kosmos Energy of Dallas, Texas. “Karmol’s unique technology means a combination of Powerships and the FSRU will bring LNG for power to countries with no domestic gas supply,” said the Karmol statement. Under the same joint venture, another FSRU is already under construction which is planned for deployment to Mozambique, another future LNG producer. “This is a big moment for West Africa and the wider continent, and an exciting time for Karmol,” said Karmol board member Gokhan Kocak. “We have a bold ambition to offer LNG-for-Power across the world and especially within Africa,” added Kocak. “Usage of FSRUs mean we can unlock the benefits of clean and affordable electricity for millions of people, even where countries have no domestic gas production or infrastructure,” he stated. “I am looking forward to the ship completing its sea trials and beginning its voyage to Senegal,” declared Kocak.

Karpowership established a joint venture with MOL in 2019 to promote LNG-for-power solutions under the brand name of Karmol. The Senegal FSRU and another vessel each have a capacity of 125,000 cubic metres. Sembcorp Marine did all the construction and conversion work. Following gas trials, the FSRU is

expected to depart Singapore early in April and is expected to arrive in Senegal in mid-May, with operations planned to begin in June.

LINDE, the German engineering and industrial gases company, and Russian natural gas company Gazprom have signed accords on the LNG and processing project at Ust-Luga west of St. Petersburg and on the Amur Gas Processing Plant in the Russian Far East. The signings came at a meeting in St. Petersburg between Alexey Miller, Chairman of the Gazprom Management Committee and Wolfgang Reitzle, Board Chairman at Linde, as well as other executives from both companies. The meeting covered several issues, including the project for the creation of the Gas Processing Complex in Ust-Luga. Kirill Seleznev, Director General of RusKhimAlyans, and Juergen Nowicki, Chief Executive of Linde Engineering, signed an agreement of intent in the presence of Miller and Reitzle.

The document outlines the main terms and conditions of a prospective Engineering, Procurement and Site Services (EPSS) contract for Linde. Gazprom and RusGazDobycha, a special purposes company securing gas supplies for Russia’s chemicals industry, are expecting the various facilities at Ust-Luga to require the processing of 45 billion cubic metres of natural gas per annum. RusKhimAlyans, a 50-50 joint venture between Gazprom and RusGazDobycha, have already signed 20-year commercial contracts for supplies of feed gas and sales gas as well as ethane fraction for chemicals.

Gazprom and RusGazDobycha are implementing the venture and RusKhimAlyans will be the operator. It is the anchor project of the major gas processing and chemical cluster that is being established in the region. “The complex will have the largest capacity in Russia in terms of gas processing and will be the largest in northwest Europe in terms of LNG production at 13 million tonnes per annum,” said Gazprom. “In addition to LNG, its commercial products will include ethane fraction, liquefied petroleum gases and pentane-hexane fraction,” it added. The parties also reviewed current issues of cooperation, including Gazprom’s Amur Gas Processing Plant (GPP) construction. “Linde’s equipment for cryogenic gas separation and for helium production is employed at the enterprise,” said Gazprom. “The GPP’s

first two production Trains are being prepared for commissioning at the moment,” the Russian company added.

MCDERMOTT International, the leading LNG and energy project engineering company, has decided to invest in Lummus Technology Holdings, the company it sold as part of its restructuring to help emerge from financial difficulties over the last several years. Under the terms of the asset purchase agreement for the sale of Lummus Technology, entered into with a joint partnership between Haldia Petrochemicals Ltd., a flagship company of The Chatterjee Group, and Rhône Capital, in January 2020, McDermott was provided the option to purchase a minority common equity ownership interest. The Houston, Texas-based company said it had now exercised this option. Lummus is a leading licensor of proprietary petrochemical, refining, gasification and gas processing technologies, and a supplier of catalysts, other equipment and related engineering services.

It became part of McDermott after the ill-timed takeover of CB&I, which itself had acquired Lummus for \$950 million in 2007 from Swiss-Swedish power and automation company ABB. “This agreement not only reinforces our already-robust and active relationship, but also reflects our support of, and belief in the Lummus long-term strategic plan,” said David Dickson, President and Chief Executive of McDermott. “Together, we will continue to combine McDermott's iEPC delivery with Lummus's innovative technology solutions to our customers across the globe,” added Dickson. The sale of Lummus was part of McDermott's comprehensive restructuring process, which McDermott successfully completed on June 30 in 2020 to help it emerge from Chapter 11 bankruptcy protection. Since the sale, McDermott and Lummus have continued to work together through their strategic agreement to connect customers to technology solutions. McDermott is involved in some of the world's leading LNG construction projects, including on the US Gulf Coast and the North Field Expansion in Qatar. McDermott has additionally been engaged as a contractor on the Golden Pass LNG export project for Qatar Petroleum and ExxonMobil.

NEXTDECADE Corp., the developer of the Rio Grande liquefied natural LNG export project in Texas, and US LNG

engineers Bechtel Inc. have completed a “pricing refresh” exercise on the lump-sum turnkey engineering, procurement, and construction agreement for the first three Trains for the facility to be located on the Brownsville Ship Channel. The Rio Grande project, owned by Houston, Texas-based NextDecade Corp, will produce 27 million tonnes per annum from five liquefaction Trains when completed. NextDecade said the new accord with Bechtel resulted in no impact to the overall cost of the project.

The pricing in the EPC agreement is now valid until the end of December 2021. Additionally, NextDecade said it had agreed with Bechtel to extend the validity of the EPC agreement until July 31, 2022. “We value our strong partnership with Bechtel, the world's leading LNG EPC contractor,” said Matt Schatzman, NextDecade's Chairman and Chief Executive. “Our global LNG customers, feed gas suppliers, and other stakeholders can have the utmost confidence in the on-time and on-budget delivery of our Rio Grande LNG project,” added Schatzman. “We are pleased to continue to progress our engineering and procurement activities under limited notices to proceed, and we look forward to providing Bechtel with a full notice to proceed with the development of this world-class project immediately following the final investment decision, stated the NextDecade CEO.

NextDecade recently decided not to proceed with another venture called Galveston Bay LNG because part of the project area in Texas was under federal law. The Nasdaq-listed company said it had been advised that the site near Texas City was not suitable for development of an LNG facility and related infrastructure and utilities. The US Army Corps of Engineers (USACE), Galveston District, had advised that a portion of the Galveston Bay LNG site is under Federal Navigation Servitude and serves as an active Dredged Material Placement Area (DMPA) for the Texas City Ship Channel Federal Project. Federal navigational servitude is an aspect of the sovereignty of the United States, grounded in the right of the Federal Government to regulate commerce, entitling the government to exert a dominance in all lands below the ordinary high water mark of navigable waters. The company emphasized at the time that the circumstances of Galveston Bay LNG being cancelled would have no impact on the Rio Grande project. The Rio Grande

plant, which is close to two other facilities in the Brownsville Ship Channel area, is awaiting an FID in 2021. Rio Grande LNG is close to the Texas LNG development, owned by New York-based Glenfarne Group, and Annova LNG whose backers include Exelon Corp., the utility headquartered in Chicago.

NORWAY, the main West European supplier of long-term pipeline natural gas directly to Germany, France Belgium and the UK, said seven companies had applied for production licences in the 25th licensing round on the Norwegian shelf with any gas finds providing more competition to LNG cargoes from outside the region. “The numbered rounds are focused on key parts in our least explored, open areas,” said Tina Bru, the Norwegian Minister of Petroleum and Energy. “They are an important supplement to the APA (awards in pre-defined areas) rounds as exploration activity in immature areas gives the state as a resource owner more knowledge about the resource potential,” explained Bru. “It enables us to identify resources and create value for the community. We will now start processing the applications from the seven companies,” she stated.

Norway, while being the main pipeline natural gas supplier to Europe, along with Russia's Gazprom, is in competition to LNG deliveries from nations such as Qatar, the US, Nigeria, Algeria and Trinidad and Tobago, as well as Russia. The Norwegians are also the only large-scale producers of LNG in Western Europe from the Hammerfest LNG plant, which has been closed until the third quarter of 2021 because of ongoing repairs from a fire in September 2020. Damage caused by the fire at the LNG facility will take until around October 2021 to repair. The fire, in which no one was killed nor injured, suffered its main damage from large amounts of seawater from the extinguishing process downing auxiliary systems such as electrical equipment and cables. Feed-gas for the single-Train Hammerfest liquefaction facility, which exports around 5 million tonnes per annum of LNG, comes from the Snohvit gas field in the Barents Sea. The 25th licensing round comprises nine areas outside the APA area on the Norwegian shelf.

The round was announced on the 19th of November 2020 and includes one area in the Norwegian Sea and eight in the Barents Sea. The companies that have applied for production licences are:

Norske Shell; Equinor Energy; Idemitsu Petroleum Norge; Ineos E&P Norge ; Lundin Norway AS; OMV (Norge) and Var Energi AS. Norway also allocates exploration areas on the Norwegian Continental Shelf and these take place annually through two equal licensing rounds. These rounds include areas in the most famous exploration areas. As exploration activity has been going on for several decades, the most well-known exploration areas now include most of the North Sea and the Norwegian Sea and a large part of the Barents Sea to the south. The Ministry in January 2021 awarded 61 upstream licences in pre-defined areas of the NCS to 30 licensees, including prominent LNG players such as BP, Shell, Total and Eni of Italy, as well as ConocoPhillips, the only bidder among US majors.

NORWEGIAN small-scale fleet and terminal business, Avenir LNG, comprising partners Stolt-Nielsen, Høegh LNG and Golar LNG, has taken delivery of another gas supply and bunkering vessel (LBV) from the Keppel Offshore and Marine shipyard in the Chinese port of Nantong. The Nordic joint venture called Avenir LNG has named its second 7,500 cubic metres capacity dual-purpose LBV, the “Avenir Accolade”, and it is now available. The company said the “Avenir Accolade” would enter a three-year bareboat charter to LNG Power Limited, a subsidiary of Hygo Energy Transition to support Hygo's developments in northeast Brazil. This is the Avenir joint venture's first entry into the Latin American LNG market.

Stolt-Nielsen, whose headquarters are in London, started up the small-scale LNG sector firm Avenir in 2015 and its two main investors, Golar and Høegh, each have 22.5 percent of Avenir. The company said that the “Avenir Accolade” would soon be delivering LNG to Hygo's customers along the Brazilian coastline. “Fitted with specialised LNG handling equipment, she will be capable of unloading LNG directly into trucks for onward distribution across Brazil,” said Avenir. The Hygo company was formerly known as Golar Power and is being acquired by New York-Based New Fortress Energy. In addition to the growing small-scale LNG fleet, Avenir has an 80 percent stake in a small-scale LNG import project on the Italian island of Sardinia and set to start up soon.

Peter Mackey, Chief Executive of Avenir, said the company strategy was

progressing on schedule. “This is a transformational year for Avenir LNG as we commission our onshore LNG terminal in Sardinia in the coming weeks and continue to expand our fleet with the addition of four more newbuild vessels by year-end,” Mackey explained. Avenir’s largest bunkering vessel, the “Avenir Allegiance” with 20,000 cubic metres capacity, entered the water in January 2021 at the Zhoushan Changhong Sinopacific shipyard in China’s eastern Zhejiang province. That vessel is scheduled to be delivered from the yard in the third quarter of 2021 and will join the Avenir fleet as the world’s largest LNG bunkering vessel. Avenir’s first newbuild delivery, the “Avenir Advantage”, took place in October 2020 and has now been followed by the “Avenir Accolade” with other newbuilds, including one named the “Avenir Allegiance”, lined up for delivery during 2021.

PEMBINA PIPELINE Corp., developer of the now blocked Jordan Cove LNG export plant in the US northwest state of Oregon, took a hit in its fourth-quarter earnings after the project was the first hydrocarbon venture stopped by the Biden Administration, though Pembina said Jordan Cove and two other ventures remained in its strategy. Pembina said Jordan Cove still made economic sense but along with two other ventures was the victim of “evolving political priorities”. The liquefaction plant was proposed for a 200-acre site at Coos Bay in Oregon, comprising five small-scale Trains, each with 1.5 million tonnes per annum of output, for a total of 7.5 MTPA. The Jordan Cove project also included the separate 230-mile Pacific Connector

Pipeline traversing four counties in southern Oregon on the route to the liquefaction plant.

Pembina commented at length on the Jordan Cove issue as it recorded a loss in the fourth quarter of C\$1.21 billion (US\$960 million) and a loss for the full year of C\$316M compared with net income of \$150M and \$1.50Bln respectively in the same periods in the prior year. Pembina said that not counting the negative one-time charges its gross fourth-quarter adjusted gross earnings came to \$866M and full-year gross income of \$3.28Bln was a record, representing a 10 percent and 7 percent increase respectively year-on-year. “Earnings in both periods were negatively impacted by C\$1.6 billion of non-cash after-tax impairments recognized in the Canada-Kuwait Petroleum Corp. (CKPC) joint venture, as well as investments in Ruby pipeline and Jordan Cove LNG,” explained Pembina. “Both periods were also negatively impacted by higher unrealized losses on commodity-related derivatives,” added the company, based in Calgary in the Canadian province of Alberta.

Pembina said that excluding impairments and the associated deferred tax recovery, earnings for the fourth quarter and full year would have been \$338M and \$1.23Bln. “If there is a silver lining to be found in 2020, it would be a clear validation of our long-term strategy, diversification efforts and steadfast commitment to the company’s financial guardrails,” said Pembina in its executive overview. “Some of the challenges we faced in 2020 were related to asset impairments. We were forced to acknowledge that due to Covid-19, alongside changing commodity price dynamics, combined with evolving political priorities, Pembina recognized an impairment in the value of certain assets, including our investments in Ruby, Jordan Cove and our CKPC petrochemical investment,” explained Pembina. “We believe these opportunities remain in strategy, make economic sense when de-risked, and are aligned with Pembina’s environmental, social and governance (ESG) priorities,” added Pembina. “We believe the time for these projects may come; however, we can sadly no longer predict with certainty when that time will be and hence were compelled to reflect their impairments in our 2020 financial statements through a non-cash charge,” stated the Canadian company.

The new US Administration had moved quickly to uphold a block imposed by one department in the state of Oregon on the Jordan Cove project as a proposed outlet for natural gas from the US Rockies and Western Canada. The Federal Energy Regulatory Commission (FERC) had previously approved the construction and operation of the Jordan Cove venture in March 2020.

PETROCHINA, the Chinese major listed in Hong Kong and with LNG and international assets, reported plunges in annual revenues and net profits of over 20 percent and 57 percent respectively as it was hit by the effects of Covid-19 and the economic slowdown. The PetroChina earnings report showed a 23 percent decline in revenues to the equivalent of US\$269 billion from US\$350.8Bln in the previous year, according to international accounting standards. PetroChina reported revenues of 1.93 trillion Chinese yuan versus 2.52Tln yuan in 2019.

The company’s net profit attributable to shareholders plunged more than 57 percent to 19 billion yuan (\$2.9Bln) compared with 45.68Bln yuan (\$6.45Bln) reported in the previous year. “We increased imports of pipeline gas and LNG, and sold 172.59 billion cubic metres of natural gas domestically, which contributed to the optimization of China’s energy mix and the construction of a beautiful China,” stated PetroChina. The company added that the oil and gas lifting costs amounted to US\$11.1 per barrel, representing a decrease of 8.3 percent year-on-year. PetroChina’s parent company, China National Petroleum Corp., imports pipeline natural gas from Central Asian countries and Russia as well LNG from projects such as Yamal LNG and from PetroChina LNG agreements. PetroChina is additionally part of Royal Dutch Shell’s LNG Canada project under PetroChina and has a stake in the Area 4 reserves in the Rovuma Basin offshore Mozambique with Italian company Eni and ExxonMobil of the US that will underpin any future Rovuma LNG project.

The Chinese National Development and Reform Commission enacted new oil and gas liberalization measures last year requiring facility operators to open up access to their oil and gas infrastructure to free up the flow of natural gas. PetroChina made a net loss of 14.16Bln yuan (\$2.16Bln) on sales of imported gas, compared with a loss of 30.7Bln in 2019. It recorded a 98Bln yuan cash gain from

its spin-off of pipeline assets to newly formed PipeChina. However, earnings from pipeline tariffs declined by 11Bln yuan after the agreement. PetroChina said its financial position “remained stable” with its gearing ratio decreasing by 2.1 percentage points year-on-year. “Despite facing challenges brought by Covid-19 and the plummeting international oil prices, the company adhered to quality-based development and coordinated and implemented a series of measures, including Covid-19 prevention and control,” said PetroChina.

PetroChina’s oil and natural gas equivalent output was 1,409.7 million barrels, representing an increase of 4.8 percent year-on-year. The company’s marketed natural gas output was 3,993.8 billion cubic feet, representing an increase of 9.9 percent year-on-year. “The proportion of natural gas output continued to increase, further optimizing the oil and gas output mix, leading to major progress in green and low-carbon transformation,” said the company. The total amount of the cash dividend for the full year will be 32Bln yuan (\$4.9Bln), representing an increase of 21.7 percent year-on-year. PetroChina’s annual output of shale gas in southern Sichuan reached 11.6 Bcm

Two major coal-seam gas projects in Qinnan and Eastern Hubei achieved output of 2.27 Bcm per year. “To meet the demands of the ‘coal-to- gas’ users and maintain stable supply of resources, the company strengthened demand-side management to make sure users in seven provinces and municipalities in northern China could enjoy sufficient gas supplies for heating in the winter months,” it added. PetroChina also outlined some of its social and climate-change activities during 2020. “During the 13th Five-Year Plan period, we joined forces with our parent company to carry out targeted poverty-alleviation activities in 1,175 villages in China,” said the company. PetroChina said it also planted a total of 2.8 million trees and established the first carbon-neutral forest in the onshore Daqing oil field in central Heilongjiang province. The company additionally stored more than 1.9 million tons of carbon dioxide in the CO2 demonstration project in the Jilin oil field in the northeast Jilin province, which borders North Korea and Russia.

QATAR has expanded its LNG horizon to return to the World No. 1 spot with a 10-year firm sales agreement with

Diary of events

May

12th World LNG & Gas Asia Pacific Summit

18-20 May, 2021

Kuala Lumpur, Malaysia

<https://www.canadagaslng.com>

June

7th China LNG & Gas International Exhibition

23 - 25 June, 2021

National Exhibition & Convention Centre (NECC), Shanghai, China

<https://www.dmgevents.com/events/>

August

Canada Gas & LNG Exhibition and Conference

23 - 25 August, 2021

JW Marriott Parq Vancouver, Canada

<https://www.canadagaslng.com/>

Chinese major Sinopec and an invitation to the leading global shipping companies to tender for the chartering of LNG carriers to carry future increased Qatari volumes. Qatar Petroleum has just signed a Sale and Purchase Agreement (SPA) with Sinopec, whose official title is China Petroleum & Chemical Corp., for the supply of 2 million tonnes per annum to Chinese terminals. The SPA was signed by Saad Sherida Al-Kaabi, Qatar's Minister of State for Energy Affairs, as well as President and Chief Executive of Qatar Petroleum, and Zhang Yuzhuo, the Chairman of the Sinopec Group, during a virtual ceremony. Under the agreement, LNG deliveries will commence in January 2022 and will be delivered to Sinopec's terminals network in China. "This SPA further demonstrates the State of Qatar's continued commitment to meeting the growing energy demand of its customers globally in the form of reliable long term LNG supplies," said the Qataris.

This follows an Invitation to Tender (ITT) for the chartering of LNG carriers for its future LNG shipping requirements, including its ongoing expansion projects in the offshore North Field of Arab Gulf waters. Al-Kaabi said that, firstly, the Sinopec supply deal would further solidify the excellent bilateral relations between China and the State of Qatar. "We are also proud of the fact that this agreement will be Sinopec's first long-term LNG SPA from Qatar, and we are hopeful that it will mark the start of a long and fruitful partnership with Sinopec," added Al-Kaabi. "Our LNG relationship with China dates back to 2009, when we started supplying LNG through a host of LNG SPAs with a number of our valued Chinese partners," explained the QP CEO. "This SPA will further supplement Qatar's contribution in meeting China's growing energy needs and we look forward to commencing deliveries under the agreement," stated al-Kaabi. Sinopec's Zhang said the LNG supply deal would help the Chinese major in its push for cleaner fuel for China. "The signing of the long-term LNG SPA with Qatar Petroleum is a further step by Sinopec to deliver its commitment to sustainability while meeting the growing needs of the Chinese market," explained Zhang. "We are proud to team up with Qatar Petroleum, one of the premier suppliers in the industry, to supply cleaner energy to China. We are also excited to begin a new journey of more comprehensive cooperation with Qatar Petroleum in the years to come," declared the Sinopec Chairman.

Khalid bin Khalifa Al Thani, CEO of Qatargas, noted that as the world's premier LNG company, Qatargas, was committed to meeting the clean energy needs of customers around the globe. Al-Thani noted that since the first LNG delivery to China in September 2009, Qatar had supplied the Chinese with more than 62 million tonnes of LNG. "China is a key and strategic energy partner for the State of Qatar throughout the entire energy value chain," he added. Qatar is also in the midst of developing its LNG production capacity from 77 MTPA to 126 MTPA by 2027 and has taken measures to acquire more shipping, in addition to newbuilds. The shipping tender package, which was issued to a large group of LNG ship owners, aims to select world-class ships for long-term time charters.

In addition to the North Field Expansion Project, the charter tender package also covers the requirements for the volumes that will be produced from the Golden Pass LNG export project in the US state of Texas being development by Qatar Petroleum with partner ExxonMobil Corp. Qatar's Al-Kaabi said the invitation to shipping companies reflected the progress Qatar Petroleum is making on the expansion of its LNG production. "Upon receiving the responses, Qatar Petroleum will review bidders' technical and commercial capabilities with the objective of assigning selected ship owners to the shipyards' construction slots, which were previously reserved at a number of Chinese and Korean shipyards," explained Al-Kaabi. "Qatar Petroleum entered into agreements with major Korean and Chinese shipyards to reserve LNG ship construction capacity for building as many as 100 new LNG carriers to cater for the needs of North Field Expansion Project in what will be the largest LNG shipbuilding program in history," noted Al-Kaabi. He stated that the tender package was part of Qatar's efforts to secure the most qualified ship owners and operators for safe and secure LNG transportation.

QATAR Petroleum entered into a new long-term supply deal with Pakistan State Oil Company (PSO) for the supply of up to an additional 3 million tonnes per annum of cargoes with prices almost one-third lower than in the previous accord. Under the 10-year agreement, LNG deliveries to Pakistan's receiving terminals will commence in 2022 and continue until the end of 2031. The accord

was signed in Islamabad between Saad Sherida Al-Kaabi, President and Chief Executive of Qatar Petroleum, and Syed Taha, Head of PSO, in the presence of Pakistani Prime Minister Imran Khan and Saoud bin Abdulrahman Al Thani, Qatar's Ambassador to Pakistan.

PM Khan's Special Assistant on Petroleum Policy, Nadeem Babar, told a later press conference that the volumes in the new Qatari contract will be about 30 percent less expensive than previously. "It is the lowest publicly disclosed LNG contract in terms of price in the world," added Babar. Babar explained that the deal would help the country save a total of up to US\$3 billion over 10 years. "The previous agreement with Qatar was for 15 years under which the price was fixed for 10 years. The new agreement, however, envisages price reopening after four years," said Babar. Qatar and PSO signed a previous agreement in 2016 for 3.75 MTPA of LNG and the new deal raises the total of long-term LNG volumes to 6.75 MTPA.

Babar added that under the new agreement, Pakistan would receive two LNG shipments on average per month and after a period of three years, the number of cargoes would increase to four. "We are delighted to enter into this new long-term agreement with Pakistan State Oil Company and to continue our contributions towards meeting Pakistan's increasing energy demand," stated the Qatar Petroleum CEO. "This agreement further extends Qatar's long-standing LNG supply relationship with Pakistan and highlights our commitment to meeting Pakistan's LNG requirements," he added. "We are confident that the exceptional reliability of our LNG supplies will provide PSO with the required flexibility and supply security to fuel Pakistan's impressive growth," said Al-Kaabi.

Pakistan currently has two operational floating LNG receiving terminals, the Engro LNG facility and the Pakistan GasPort terminal. Both use floating storage and regasification units (FSRUs) and are located at Port Qasim, east of the city of Karachi. In further comments, Al-Kaabi noted that Pakistan had a well-established gas market and distribution system and was strategically important for Qatar. "We are encouraged by Pakistan's exceptional growth and excellent economic potential as well as by the prospects of it being one of the world's fastest growing LNG markets," added Al-Kaabi. "I would like to take this opportunity to thank Prime Minister

Imran Khan for his support and for his patronage of this special event. I also would like to thank Pakistan's energy officials as well as PSO's management for all their efforts," stated Al-Kaabi.

SHELL said that demand for liquefied natural gas worldwide is forecast to hit 700 million tonnes by 2040 and Asia is expected to drive nearly 75 percent of this growth as Asian domestic gas production declines and LNG imports are used to tackle air quality concerns. "For instance, China's heavy-duty transport sector consumed nearly 13 million tonnes of LNG in 2020, almost doubling from 2018, to serve the fast-growing fleet of well over 500,000 LNG-fuelled trucks and buses," noted the Anglo-Dutch company's fifth annual outlook on LNG. "LNG-fuelled shipping is also growing, with the number of vessels expected to more than double and global LNG bunkering vessels set to reach a total of 45 ships by 2023," it said. As demand grows, a supply-demand gap is expected to open in the middle of the current decade with less new production coming on-stream than previously projected. "Just 3MT in new LNG production capacity was announced in 2020, down from an expected 60MT," added the report.

Shell explained that because of the net-zero emissions targets companies are having to make, the LNG industry will need to innovate at every stage of the value chain to lower greenhouse-gas counts. The company said that over the past year LNG prices hit a record low early in 2020 but ended the 12-month period at a six-year high as demand in parts of Asia recovered and winter buying increased against tightened supply. "LNG provided flexible energy which the world needed during the Covid-19 pandemic, demonstrating its resilience and ability to power people's lives in these unprecedented times," said Maarten Wetselaar, Director at Shell for Integrated Gas, Renewables and Energy Solutions. "Around the world countries and companies, including Shell, are adopting net-zero emissions targets and seeking to create lower-carbon energy systems," he added. "As the cleanest-burning fossil fuel, natural gas and LNG have a central role to play in delivering the energy the world needs and helping power progress towards these targets," stated Wetselaar.

LNG trade increased to 360MT in 2020 and despite the "unprecedented volatility" caused by the Covid-19 pandemic the industry is moving towards a period of

expansion. China and India led the recovery in demand for LNG following the outbreak of the pandemic with both countries increasing their LNG imports by 11 percent. “Demand in Europe, alongside flexible US supply, helped to balance the global LNG market in the first half of 2020,” said the report. “However, supply outages in other supply basins, structural constraints and extreme weather later in the year resulted in higher prices,” it added.

SHELL said it signed agreements to charter 10 new crude oil tankers powered by dual-fuel liquefied natural gas engines and under construction in South Korea. Four of the very large crude carriers (VLCCs) have been chartered from Switzerland-based Advantage Tankers, three from Malaysian-owned AET and three from US-headquartered International Seaways. All 10 ships will be built in South Korea by Daewoo Shipbuilding and Marine Engineering and the first vessel will be operational from 2022 and be on charter to Shell for seven years.

“The main engines and vessel design chosen for the ships will mean these tankers have the lowest possible methane slip and highest fuel efficiency including on average 20 percent less fuel consumption compared to eco-VLCC vessels on the water,” said Shell.

Shell stated that it continued to significantly invest in LNG for its long-term charter fleet with 14 in service by the end of 2021. “This order is expected to bring the total global dual-fuel LNG fleet to 475, marking yet another important step on the predicted doubling of LNG-fuelled vessels on the water by 2023, as ship owners respond to customer calls to choose the cleanest technologies available,” explained the Anglo-Dutch company. Grahaeme Henderson, Global Head of Shell Shipping & Maritime, said it was imperative that the shipping sector immediately employs the cleanest fuels available. “This significant commitment will see Shell hit a new milestone for our fleet decarbonisation with an average of 50 percent of our crude tankers on time charter powered by dual-fuel LNG engines once in service,” said Henderson.

Shell is also rapidly making LNG available on global trading routes at major ports in Europe, Asia and North America to meet customer demand with tankers and the bulk and liner segments continuing to grow. “By 2023, marine LNG demand is expected to reach around

3.6 million tonnes with 45 bunker vessels expected to be in service,” added Shell. South Korean shipbuilder DSME said the newbuilds would have significantly lower emissions. “The vessels have been designed with state-of-the-art technologies and not only achieve a huge reduction in greenhouse-gas emissions but are also economically viable,” stated Sung Geun Lee, President and Chief Executive of DSME. “They have a low fuel consumption with their dual-fuel LNG engines and will bring significant benefits to both the charterer and the ship owners over the long-term,” he added.

SINGAPORE, through the Maritime and Port Authority of Singapore (MPA), has awarded a third LNG bunkering supplier licence to French energy major Total to operate in the Asian city-state supplying ship-to-ship fuel. The licence was given to subsidiary Total Marine Fuels Private Ltd for a five-year term starting from January 2022. “Total Marine Fuels Private Limited is a global LNG supplier and an experienced operator providing end-to-end LNG bunkering solutions that will complement the existing two licensees,” said an MPA statement. The other two licence holders are FuelNG Pte Ltd, a joint venture comprising Keppel Offshore and Marine and Shell Eastern Petroleum, and Pavilion Energy, a subsidiary of Singaporean wealth fund Temasek. FuelNG has seen the debut of the first Singapore-owned LNG bunkering vessel, the 7,500 cubic metres capacity “FuelNG Bellina”, which entered service in February 2021.

The vessel is operated for the Keppel-Shell venture in the port by the Japanese shipping company, Kawasaki Kisen Kaisha (K-Line). The MPA noted that in planning ahead to meet the region’s growing demand for LNG as a marine fuel, it had issued a Request for Proposal on 28 October 2020 for parties seeking to supply LNG bunker in the Port of Singapore. Singapore currently has an LNG bunker supply capacity of up to one million tonnes per annum, offering clean marine fuel to LNG-powered vessels, thus reducing emission such as nitrogen oxides and greenhouse gases. “We are honoured to be awarded by MPA the licence to supply LNG as a marine fuel in Singapore,” said Jérôme Leprince-Ringuet, Vice-President, Marine Fuels at Total. “This achievement underscores Total’s goal to be a leading LNG bunker supplier globally,” added Leprince-

Ringuet. “LNG is the best, immediately available solution to reduce our shipping customers’ carbon footprint and it paves the way towards carbon-neutral bioLNG and synthetic methane,” he explained. “We will continue to ramp up our investments to deliver competitive, reliable and end-to-end LNG bunkering solutions for customers in Singapore and beyond,” stated the Total executive.

Quah Ley Hoon, Chief Executive of MPA, said that as the world’s top bunkering hub, the Port of Singapore was well-positioned to expand its offering of marine fuel solutions. “LNG serves as a viable and clean transitional marine fuel to reduce carbon emissions from ships,” she said. “We welcome Total Marine Fuels Private Limited’s entry into Singapore’s LNG bunker market to bolster the country’s ambition in becoming Asia’s leading LNG bunkering hub,” added Quah.

SNAM, the Italian natural gas network and LNG terminal operator, said it was exploring opportunities to expand into the small-scale and mid-scale liquefaction plant sector and had signed an agreement on technological collaboration. Snam, whose name comes from Societa Nazionale Metanodotti (National Pipeline Company), operates the Italian gas grid and two LNG import terminals, the “FSRU Toscana” moored offshore the West Coast of Italy and the onshore Panigaglia facility near the port of Genoa. Snam said it had signed an agreement with the Italian SIAD group, a producer and supplier of industrial gases, to foster the use of small-scale LNG and Bio-LNG as alternative fuels and for off-grid customers.

The agreement, signed by the Snam Chief Executive Marco Alverà, and the Chairman of SIAD, Roberto Sestini, has as its goal the building of small-scale and medium-sized plants for the liquefaction of natural gas and biomethane on a global scale, on behalf of third-party customers. The plants proposed by Snam and SIAD will be modular and standardised, with capacities ranging from 50,000 to 100,000 tonnes per annum in the case of small-scale plants and from 200,000 tonnes per annum for the medium-sized facilities. “With this agreement, Snam is entering the liquefaction infrastructure sector, which will be key to enable sustainable mobility by road, rail and potentially sea, as well as decarbonising other energy uses,” said Snam CEO Alverà. “LNG, especially in its ‘bio’ version, makes it

possible to reduce both polluting and CO2 emissions. Thanks to this collaboration with SIAD, we will make an innovative energy transition solution available to both Italy and other countries,” he added.

Chairman of SIAD, Roberto Sestini, said the agreement reached with Snam for the development of methane and biomethane liquefaction plants would be made possible by the expertise and technical experience of his group. “More than 500 plants have been built and installed in different parts of the world for the production of oxygen, nitrogen and argon, which all require the liquefaction of air,” he explained. “Based on this technological knowledge, it has been possible to design different sizes of methane liquefaction plants with efficient energy consumption and cost savings,” stated Sestini. As part of the collaboration between Snam and SIAD, the companies are already developing their first small-scale plant at Campania in southwest Italy. The facility will have a capacity of 50,000 tonnes per annum and which has already received funding from the European Union.

SOVCOMFLOT, the Russian shipping line with 31 gas carriers in operation or on order and an overall fleet of 145 vessels, posted a more than 18 percent jump in annual net profits as revenues also increased. Sovcomflot (SCF) reported a net profits rise to \$266.9 million in 2020 compared with \$225.4M in the previous year. Time charter equivalent (TCE) revenues for the year rose by 6.7 percent to \$1.35 billion from \$1.26Bln in 2019. SCF is involved in servicing large oil and gas projects in Russia and around the world, including the Sakhalin and Yamal LNG export plants in Russia and Tangguh LNG in Indonesia.

The group said it continued to expand its long-term industrial business portfolio, with a special focus on operations in harsh environments ice conditions. More than 80 of the group’s ships are ice-class. “SCF’s business portfolio, comprising of gas transportation, LNG as well as liquefied petroleum gas (LPG) vessels, and harsh environment offshore services (shuttle tankers and ice-breaking supply vessels) accounted for a half of the TCE revenue in 2020 and continues to provide a long-term fixed income revenue stream,” explained the company. Annual net revenues from vessel trading jumped by 8.2 percent to \$983.7M from \$909.2M in the previous year. During 2020, SCF

has either directly or through its Smart LNG joint venture with Russian natural gas and LNG plant operator and developer Novatek, time-chartered 17 ice-breaking carriers to the Arctic LNG II project. In February and September 2020, SCF took delivery of two next-generation 174,000-cbm Atlanticmax LNG carriers, “SCF La Perouse” and “SCF Barents”, both chartered to energy majors, Total and Shell, under long-term contracts.

A third sister ship, “SCF Timmerman”, which is chartered also to Shell, was delivered and began its operations in January 2021. After the earnings reporting date, SCF and Total in January 2021 concluded a long-term charter agreement for a newbuild Atlanticmax LNG carrier with 174,000 cubic metres capacity and with options for up to a further two vessels. Delivery of the first vessel is scheduled for the third quarter of 2023. SCF also noted the “unique voyage” of SCF’s LNG carrier, the “Christophe de Margerie”, as it expanded the navigation window in the eastern part of the Russian Arctic. “In January-February 2021, SCF’s LNG carrier ‘Christophe de Margerie’ completed a round voyage between Sabetta (Russia) and Jiangsu (China) using the Northern Sea Route (NSR),” said SCF. “For the first time in history, a large-capacity cargo vessel crossed the eastern sector of the NSR in February. Transit navigation along this segment traditionally ends in November and only resumes again in July,” added the company.

SCF conducted an initial public offering in October 2020 and sold 408.29 million ordinary shares of a nominal value of 1 Russian rouble and at a price of 105 roubles (\$1.37) per ordinary share and listed them on the Moscow Exchange. The free float of SCF amounts to 15.6 percent of the company and the balance of shares is held by the Russian Federation. SCF President and Chief Executive Igor Tonkovidov praised the efforts of employees in a challenging year for the shipping industry in terms of operational restrictions with Covid-19 changing sanitation rules and closing borders in many areas of fleet operations. “We are grateful to our crews and shore personnel, whose health and safety was our prime focus,” stated Tonkovidov. “With swings in global oil demand causing extreme volatility across energy markets, SCF has demonstrated resilience to such turbulence and has produced further increases in its key operational and financial metrics,” he added.

SRI LANKA has launched a tender process to secure a floating storage and regasification unit to start imports of liquefied natural gas offshore the port of Kerawalapitiya, located north of Colombo, for use by the power industry. The island nation’s state power company, the Ceylon Electricity Board (CEB), has called for proposals for the development of the FSRU-led terminal on a build, own and operate basis. Numerous plans to import LNG have made little progress over the past 10 year in contrast to larger neighbours India and Pakistan where LNG has taken off. Shipping LNG into the country is the only way of introducing gas to Sri Lanka, which has inadequate infrastructure and limited undeveloped offshore natural gas resources.

Under the CEB tender, the proposal also includes securing a compatible mooring system on a build, own, operate and transfer basis. The deadline for submissions in the tender documents is the 18th of June 2021. The FSRU is expected to have a regasification capacity of 380 million cubic feet per day and 156,000 cubic metres storage capacity. Subsea and onshore pipelines will be developed by Ceylon Petroleum Corp. (CPC), according to the documents. The winner of the FSRU tender will be expected to design, finance, procure, build, deliver, commission, operate and maintain the FSRU. The same applies to the mooring system, which will also have to be transferred to the CEB at the end of the contractual term. Sri Lanka’s government is hoping that gas can make up at least one-third of the country’s energy mix by 2030.

The Public Utilities Commission of Sri Lanka has additionally approved the construction of a 300-megawatt gas-fired power plant. A power purchase agreement has also been signed between CEB and the local independent power producer, Lakdhanavi. Lakdhanavi is Sri Lanka’s first and largest non-state power company and also operates an engineering, procurement and construction contractor business for combined cycle power plants, diesel engine-based plants, mini hydro-electric facilities and wind projects. If the project goes ahead it would be the first major power plant constructed in nearly 10 years and in the wake of the 16-year civil war that ended in 2009.

TEEKAY LNG Partners, whose gas group units own, charter or have stakes in 77 vessels, including 47 liquefied

natural gas carriers and 30 liquefied petroleum gas or multi-gas vessels, reported annual net income almost halved, though its long-term charters strategy partially protected the company from the worst of the challenges. Teekay LP said its net profits for 2020 came to \$87.35 million compared with \$152.79M in 2019. For the fourth quarter net income was also down by around the same margin to \$35.14M versus \$67.37M in the prior year quarter. Voyage revenues increased in the fourth quarter to \$154.07M versus the \$148.79M recorded in the same three months of 2019.

Annual voyage revenues were slightly lower at \$591.1M compared with \$601.25M for the previous year. “For both the fourth quarter and fiscal year 2020, we generated strong earnings and cash flows resulting in the highest ever recorded annual adjusted results for Teekay LNG,” stated Mark Kremin, President and Chief Executive of Teekay Gas Group Ltd. “During a year which saw extreme volatility in gas prices, LNG shipping rates and equity markets, our strategy of chartering substantially all of our LNG fleet on long-term contracts helped us to achieve consistently strong results,” explained Kremin. “Throughout the year we maintained certainty and forward visibility amid the unprecedented uncertainty and volatility that impacted many others in the broader energy space in 2020,” said the CEO.

In its LNG chartering activities, the charterer of the 52 percent-owned LNG carrier “Marib Spirit” decided in October 2020 to exercise its options to extend the current charter by 14 months at a higher rate, extending the vessel’s charter coverage to early 2022. The Partnership’s 52 percent-owned joint venture with Marubeni Corp. (the MALT joint venture) secured a two-year, fixed-rate charter contract in December 2020, with a one-year option, for the “Methane Spirit” which is expected to commence after its current charter contract ends in March 2021. Teekay LP noted that quarterly income from vessel operations for the LNG segment for the three months to the end of December decreased, primarily due to a \$14.3M gain on the derecognition of the “WilForce” and “WilPride” LNG carriers as they were reclassified as sales-type leases prior to their sale in January 2020. The Hamilton, Bermuda-based company said that in December, the 50 percent-owned LPG joint venture with Belgium’s Exmar NV successfully

refinanced its \$254M revolving credit facility and term loan by entering into a new revolving credit for \$310M maturing in December 2023.

TOKYO GAS, the second-largest Japanese liquefied natural gas importer, has completed construction of a high-pressure pipeline called the Ibaraki Line to complete the mutual back-up system between four LNG import terminals as the Hitachi facility has also expanded storage. The utility and city-gas company said the link between the cities of Hitachi and Kamisu in Ibaraki Prefecture has now been completed and has just commenced services. Tokyo Gas has also completed the construction of LNG Tank No. 2 at the Hitachi LNG import terminal and it began commercial operations on March 10. The new LNG storage tank at the Hitachi terminal has capacity of 230,000 cubic metres, the same as the other tank at the terminal.

There is also a third storage tank for liquefied petroleum gas (LPG) at the facility. The terminal has five LNG vaporizers and berths for domestic vessel off-loading of LNG and LPG. Other facilities at Hitachi LNG include 10 loading lanes for LNG trucks. “By connecting a loop of high-pressure gas pipelines and increasing the capacity of LNG tanks in the North Kanto area in addition to the Tokyo area, Tokyo Gas has achieved improved supply stability and enhanced gas transmission capacity through a mutual backup system of four LNG terminals,” stated Tokyo Gas. The Japanese LNG terminals now linked up by Tokyo Gas are the Negishi and the Ohgishima terminals in Yokohama, the Sodegaura facility in Chiba Prefecture, and the Hitachi terminal in Ibaraki.

Tokyo Gas, one of the nation’s LNG pioneers, is the second-largest LNG importer after Jera Co. Inc., the joint venture combining Tokyo Electric Power Co. and Chubu Electric assets. Tokyo Gas has contracts with the world’s largest LNG producers in Australia, Asia and in the US where it has a tolling contract at the US Cove Point plant in Maryland. The company’s Negishi terminal received the first Tokyo Gas cargo from Cove Point in October 2018. “Under its management vision, the Tokyo Gas Group will continue to strive to ensure safe, stable energy supply by reinforcing its cooperation with local governments and infrastructure providers to increase the resilience of the natural gas infrastructure,” stated the company. ■



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MES unveils new LNGC main propulsion unit

Competition for gas burning 2-stroke engines is hotting up, as a new LNGC prime mover is unveiled. Technical Editor Ian Cochran investigates.

At a demonstration in Copenhagen last month, MAN Energy Solutions (MES) showed off its latest low-speed, dual-fuel engine - the MAN B&W ME-GA.

For the past year or so, WinGD has held a virtual monopoly in the newbuilding LNGC engine market. This will now be challenged by MES' latest offering.

MES explained that the new engine is an Otto-cycle variant of the company's successful ME-GI engine types and was designed for operating on LNG and fuel oil. It was developed in co-operation with its licensee Hyundai Heavy Industries.

As its pre-mixed combustion results in low NOx emissions, the ME-GA engine is claimed to be inherently Tier II and Tier III compliant in gas-operation mode.

In addition, to fully utilise its dual-fuel potential in Tier III areas, the engine is being offered with an exhaust gas recirculation (EGR) system.

MES said that it aimed to start testing the first, commercial ME-GA design by the end of this year, with the first engine delivery following in early 2022.

Speaking at the demonstration, Wayne Jones, MES Chief Sales Officer, said: "Our development of new technologies is directly influenced by the close relationships we have with our customers. We initiated this ME-GA project in late 2017 when we recognised a strong market desire for a lower-cost alternative to the ME-GI engine, driven primarily by the LNG carrier market.

"Crucially, this new supplement to our dual-fuel portfolio continues our

shipping and further the maritime energy transition to sustainable fuels," he said.

Bjarne Foldager, MES Senior Vice President and Head of 2-Stroke Business, added: "It's taken a team of 150 colleagues, and hundreds of tests and operational hours, to get the engine to this important stage. In doing so, we have drawn on the invaluable experience gained from developing our successful ME-GI concept.

"Similarly, our proprietary EGR system also plays an important role in the ME-GA set-up. Not only does it deliver NOx-compliance, it also helps maintain control of the ignition process and reduces fuel consumption by 3 and 5% in gas and fuel-oil modes, respectively.

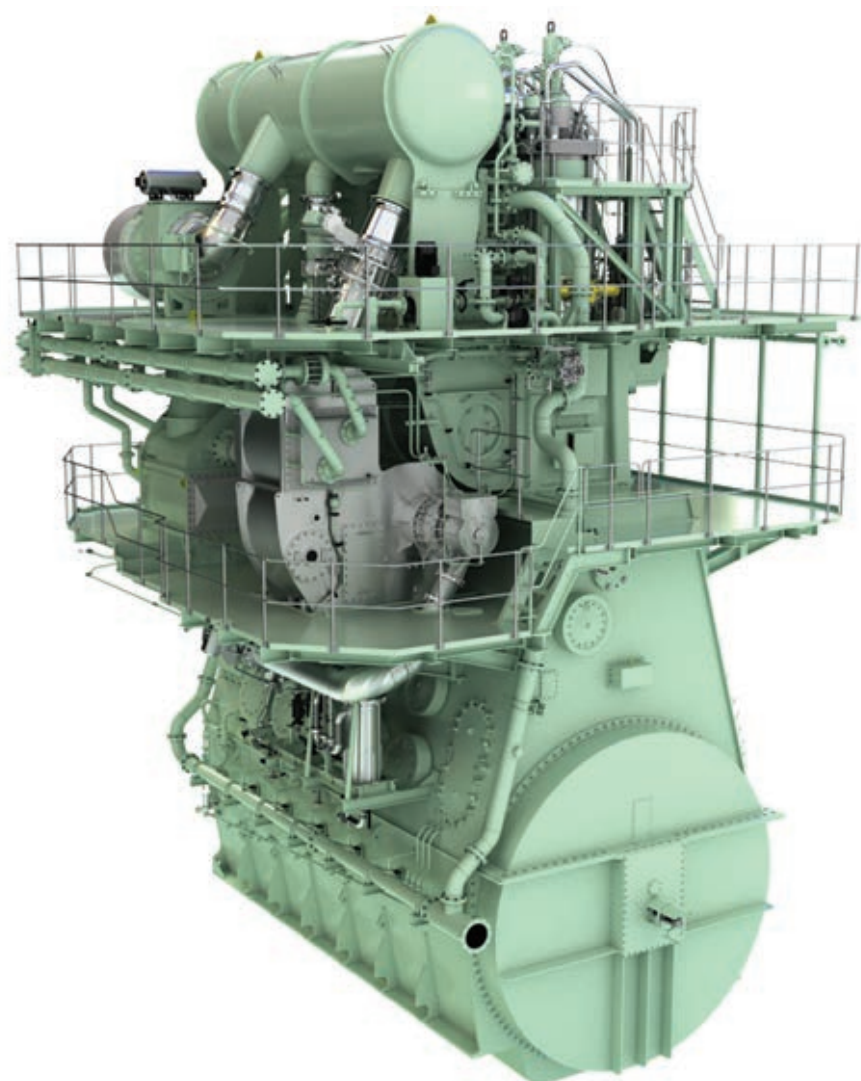
"This is just the latest milestone in the dual-fuel strategy we have followed over the past decade, and further confirms our leadership in this critical marine segment. Our dual-fuel engines continue to act as standard bearers for environmentally friendly, reliable propulsion-technology with their seamless switching between fuels. Ultimately, we expect the ME-GA to become standard among LNG carriers," he claimed.

At the demonstration, which was held remotely, MES said that its portfolio of 2-stroke, dual-fuel engines had accumulated over 1.6 mill operating hours from the 155 engines (6.3 GW) currently in service – all of which are running on clean fuels, such as LNG, LPG, ethane and methanol.

With fuel prices and availability currently in flux, MES said that it expected the option of retrofitting to dual-fuel engines to increasingly become a necessity.

Low CAPEX

The ME-GA engine delivers a low CAPEX solution aimed at certain vessel types and applications, such as LNGCs, that are able to use 'boil-off' gas as a source of fuel. It will also appeal to owners of smaller vessels, where low capital outlay is a priority, the engine designer said.



MAN B&W ME-GA engine

It was described as a dual-fuel design with minimal installation requirements. It uses an efficient ignition concept and unique gas-admission system. Furthermore, the new engine offers minimal operational costs, simple supply and purging concepts, and low maintenance costs for its fuel-gas supply system.

With Tier III compliance in gas mode, the engine meets all current and upcoming NOx emission regulations with the addition of an EGR, MES said.

Last November, MES announced that it would offer its proprietary EGR system as an emissions solution for the ME-GA. EGR is a NOx-emissions-reduction technique that ensures IMO Tier III-compliance in diesel mode for this engine type.

MES claimed that with an EGR system fitted, this will enable the ME-GA to reduce specific gas consumption by about 3% and specific fuel-oil consumption by 5%. It will also significantly reduce methane slip by 30 to 50%, and improve the stability of the Otto-cycle combustion process.

EGR will also enable the ME-GA to meet Tier III requirements in both fuel oil and gas modes without the need for additional after treatment.

The ME-GA EGR solution is a high-pressure system, which can be integrated into existing engine room designs, while the EGR unit itself does not change the engine footprint. Its design-similarity to that of ME-C engines' EGR systems will lower its basic price, as the supply chain and components are already matured.

The volume requirements of the ME-GA EGR system are also significantly lower with, for example, less pipework required than for low-pressure EGR solutions.

At the demonstration, MES said that there will be around 60 large LNGCs ordered per year for the next 10 years. These will be mainly fitted with dual-fuel engines and reliquefaction plants.

The company offers a long term service agreement (LTSA) and thus far, around 36 LNGCs have signed up for this service, MES said.

"This is just the latest milestone in the dual-fuel strategy we have followed over the past decade..."

mission to de-carbonise

Specialist FSRU converted for African power project

Japanese and Turkish joint venture company KARMOL's first FSRU conversion was delivered on 15th March from Singapore's Sembcorp Marine shipyard. Technical Editor, Ian Cochran reports.

Following gas trials, the FSRU is expected to depart Singapore in early April, arrive in Dakar, Senegal in mid-May, with operations planned to begin in June in the West African country.

She was converted from the 1994-built LNGC 'Dwiputra'.

The FSRU, named 'Karmol LNGT Powership Africa', will be used by KARMOL- a joint venture between Mitsui OSK (MOL) and Turkish power provider Karpowership- to produce LNG-powered electricity in Senegal for the first time using its patented floating powership, 'Karadeniz Powership Ayşegül Sultan'.

Karpowership has been operating the 235 MW capacity powership in Dakar to produce around 15% of the country's electricity supply since August, 2019.

Once the FSRU has arrived on site and is ready for operations, the powership will switch to LNG fuel, which is scheduled to start before the end of June.

A combination of powerships and FSRUs will mean that LNG-to-power technology will be available to countries with no domestic gas supply. The company said it plans to switch its entire fleet of 20 powerships to LNG power.

Under the joint venture, a second similar FSRU - 'Karmol LNGT Powership Asia' - is also being converted in

Singapore, which is to be deployed in Mozambique.

KARMOL Board Member, Gokhan Kocak, said: "This is a big moment for West Africa and the wider continent, and an exciting time for KARMOL.

"We have a bold ambition to offer LNG to power across the world and especially within Africa. Usage of FSRUs mean we can unlock the benefits of clean and affordable electricity for millions of people, even where countries have no domestic gas production or infrastructure. I am looking forward to the ship completing its sea trials and beginning its voyage to Senegal.

"The use of FSRUs and powerships is a ground-breaking solution, which opens up the prospect of stable electricity, powered by efficient, cleaner fuels, to many more countries. Our KARMOL partnership is at the core of a long-term plan to bring reliable, economical and green electricity to our current partners and new customers," he said.

KARMOL representative, Kensuke Ito, added: "The vessel symbolises MOL and Karpowership's continued partnership and represents our strong commitment to providing LNG-to-Power solutions to the African region.

"This milestone has been achieved against the most challenging of backdrops

with the ongoing global COVID pandemic, which makes this all the more satisfying," he said.

MOSS type

'Karmol LNGT Powership Africa' is 272 m long and 47.2 m wide. The 125,470 cu m capacity FSRU is fitted with MOSS type containment tanks and will be modified for spread mooring operations.

Her regas capacity will be a maximum 84 mill sq ft per day with a send out pressure of up to 10 barg. She is fitted with four 50 cu m per hour feed pumps and three boil-off gas compressors rated at 2,000 kg per hour each.

MOL told *LNG Journal* that the FSRU's capabilities will include bunkering, FSRU to powership gas supply and FSRU to land-based power plants supply.

The Japanese major also explained that the parties had agreed to collaborate in the LNG-to-Powership business to become the world's most reliable and preferable LNG to powership solution provider, under the brand name of KARMOL in 2019.

Both companies aimed to co-invest in the assets and jointly market the solution in selected markets worldwide.

KARMOL will generate power using the powership by receiving regasified

LNG through an FSRU to provide electricity to shore grids and facilities where base load electricity and/or replacements of fuel mode are required to meet the environmental concerns.

MOL claimed that the advantages of the collaboration were -

- (1) Very competitive initial Capex construction costs and fast track solution to provide LNG to power to create immediate savings for customers and to meet power demand.
- (2) Replacement of higher emission fuels by LNG to significantly reduce greenhouse gas emissions.
- (3) Business synergy is assured by combining both companies track records, ie MOL's track record and expertise of LNGC and FSRU operations and Karpowership's track record and expertise in managing powerships.

Karpowership is owned by Karadeniz Holding, which was founded in 1948 and has interests in the finance, real estate, and shipbuilding industries.

In 2007, Karpowership began the production of the first floating power plant powership fleet. Currently, Karpowership owns and operates 20 powerships in countries, including Indonesia, Ghana, Mozambique, Gambia, Sierra Leone, and Lebanon. ■



'Karmol LNGT Powership Africa' seen during her float out at Singapore on 1st August 2019

Global trade lanes strengthen case for LNG fuelling

The use of LNG as a fuel of choice on global shipping trade lanes is set to strengthen this year as operators explore means to further decarbonise fleets, John Hatley, VP Marine Solutions for Wärtsilä North America told LNG Journal Fuelling editor Malcolm Ramsay.

The impact of the Covid pandemic and a shift in U.S political outlook has driven a raft of initiatives and promise of investment across the shipping sector this year, with LNG steadily emerging as a key option for shippers.

“We are now seeing the broad development of LNG global trade lanes, with LNG available in quantity at multiple points around the globe,” Hatley explains.

While LNG has been established as a fuel for smaller vessels in some areas for years, the move towards larger ships has accelerated in recent years as technology and bunkering infrastructure has developed.

The rate at which records have been broken for the size of new LNG vessels is matched only by the rate at which even larger vessels have been announced, with many expected to hit the waters in the next five years. Landmark vessels such as CMA CGM’s Jacques Saade, the world’s largest LNG-powered containership, have brought LNG to a whole new scale and accelerated investment in LNG bunkering infrastructure at ports all along global trade routes.

Fundamental shift

The *Jacques Saade* launched last year has a capacity of 23,000 TEUs, making it amongst the largest megamax boxships on the water. This shift from a fuel for prototype ships and small, short-haul trips to a fuel for the very largest of ocean-going vessels is set to continue as cost synergies develop.

“There has been a fundamental shift in the market place as LNG has become more widely available and we have seen it become a fuel of choice in global trade lanes to meet the new demand for



LNG bunkering vessel simulator

decarbonization,” Hatley comments.

As well as the largest LNG-fuelled containership, records for the largest LNG-fuelled tankers, ferries, and bunker vessels have all been smashed in recent years indicating this shift spreading across sectors and operators’ business models.

“From charters to vessel owners to investors to banks the story is the same, as LNG is recognised as the least carbon-emitting fuel available today, in every place, in usable form. It may not be the most bleeding-edge fuel available but it is the most readily available alternative,” Hatley adds.

Alongside the ready availability of the fuel, the flexibility of LNG is also emerging as a key differentiator, with the pandemic having driven forward clear advantages for LNG-fuelled vessels versus scrubber technology.

“No-one can predict what is going to happen. Certainly no-one saw the case for scrubbers collapsing like it has. Major shipping lines were fully behind scrubber technology ahead of the IMO sulphur

regulation but the pandemic and resulting collapse in price differential between HFO and LSFO means scrubbers are not viable. This has helped LNG fuelling significantly as scrubbers were the only viable alternative for many vessel operators,” Hatley states.

Bio-LNG drop in

Looking further ahead, the availability of widespread LNG bunkering infrastructure on all global trade lanes will also facilitate further decarbonisation in future as alternative forms of gas fuel become more widely available.

One of the most promising solutions is the development of BioLNG based on syngas reclaimed from waste or generated via new carbon-negative technologies that can harness excess renewable electricity to create gas. While these technologies are not yet available at scale the potential to mix LNG derived from natural gas with new alternatives means that existing infrastructure can be used to steadily decarbonise fuel without additional modification to vessels.

“Looking forward, bio drop-in LNG is also the perfect fuel from 2030 forward as decarbonisation limits become stricter. BioLNG is carbon-neutral or can even be carbon negative depending on how it is sourced,” Hatley notes.

LNG training

Headquartered in Helsinki, Finland, Wärtsilä provides smart technologies and complete lifecycle solutions for the marine and energy markets and is known for its LNGPac gas handling

system and its 50DF dual fuel engine.

The firm recently launched a new LNG Bunkering & Supply System simulator to promote greater safety onboard LNG fuelled vessels. Based on Wärtsilä’s LNGPac and Gas Valve Unit technologies, the simulator includes all auxiliary systems used in connection with the fuel supply and has been designed in accordance with STCW requirements for training seafarers onboard gas fuelled ships to standards demanded by the IGF Code – the international code of safety.

“As the move towards LNG fuel gathers pace in the marine industry, it is essential that crews are thoroughly and expertly trained on handling the related systems. This new simulator is designed to raise training levels on LNG bunkering and supply systems, and will therefore also raise onboard safety levels,” says Sergey Tarasov, Solutions Manager, Wärtsilä Voyage Solutions.

The simulator will realistically recreate on-vessel operations related to LNG fuelling, and allow students to troubleshoot problems in real-time. Trainees interact with the tool via a replica user interface as well as animated 3D visualisations.

The Wärtsilä LNG Bunkering & Fuel Supply System simulator is available as a one-off purchase or on an annual subscription basis. It is part of the successful TechSim 5000 product line, which includes various engine room and liquid cargo handling simulators that have been installed in training centres around the world. The LNGPac simulator enables a number of different configurations tailored to the customer’s needs. ■



LNG fuel supply system



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LNG Carrier	Capacity m ³	Registered Owner	Builder	Delivery	Flag	Power Plant	Cargo System	No. of Tanks	Original Project
Aamira	268,000	Nakilat SHI 1753 Inc.	Samsung	Apr-10	Marshall Is.	Diesel	TZ Mk. III	10	Qatargas IV
Abadi	135,000	BGC One Nbd Sdn Bhd.	Mitsubishi	May-02	Brunei	Steam	Moss	5	Lumut
Adam LNG	162,000	Adam Maritime Transportation	HHI	Jul-14	Marshall Is.	Diesel	Membrane	4	Oman LNG
Adriano Knutsen	180,000	Hai Feng 1717 Ltd.	HHI	Jul-19	Spain	ME-GI	TZ Mk. III Flex Plus	4	Corpus Christi
Al Aamriya	210,168	J5 Nakilat No. 1 Ltd.	Daewoo	May-08	Marshall Is.	Diesel	GT NO 96	5	RasGas III
Al Areesh	148,786	Al Areesh LLC	Daewoo	Jan-07	Bahamas	Steam	GT NO 96	4	RasGas II
Al Bahiya	210,100	Nakilat DSME 2286 Inc.	Daewoo	Dec-09	Marshall Is.	Diesel	TZ Mk. III	5	Qatargas IV
Al Biddah	137,339	Mitsui/Nippon/Kawasaki/lino	Kawasaki	Nov-99	Japan	Steam	Moss	5	Qatargas I
Al Daayen	148,853	Al Daayen LLC	Daewoo	Mar-07	Bahamas	Steam	GT NO 96	4	RasGas II
Al Dafna	268,000	Nakilat SHI 1726 Inc.	Samsung	Oct-09	Marshall Is.	Diesel	GT NO 96	10	RasGas
Al Deebel	145,000	Peninsula LNG Transport No. 3	Samsung	Nov-05	Bahamas	Steam	TZ Mk. III	4	RasGas II
Al Gattara	216,200	Overseas LNG H1 Corp.	HHI	Nov-07	Marshall Is.	Diesel	TZ Mk. III	4	Qatargas II
Al Ghariya	210,150	Julia Neptora	Daewoo	Dec-07	Bahamas	Diesel	GT NO 96	4	Qatargas II
Al Gharrafa	216,200	Overseas LNG H2 Corp.	HHI	Jan-08	Marshall Is.	Diesel	TZ Mk. III	5	Qatargas II
Al Ghashamiya	217,591	Nakilat SHI 1696 Inc.	Samsung	Apr-09	Marshall Is.	Diesel	TZ Mk. III	10	Qatargas III
Al Ghuwairiya	263,300	Nakilat Al Ghuwairiya Inc.	Daewoo	Dec-08	Marshall Is.	Diesel	GT NO 96	5	Qatargas II
Al Hamla	216,200	Overseas LNG S2 Corp.	Samsung	Feb-08	Marshall Is.	Diesel	TZ Mk. III	4	Qatargas II
Al Hamra	137,000	Al Hamra Ltd.	STX	Nov-96	Liberia	Steam	Moss	4	Das Island
Al Huwaila	217,000	Al Huwaila Inc.	Samsung	May-08	Bahamas	Diesel	TZ Mk. III	10	RasGas III
Al Jasra	137,227	Mitsui/Nippon/Kawasaki/lino	Mitsubishi	Jun-00	Japan	Steam	Moss	5	Qatargas I
Al Jassasiya	145,700	Venice Maritime	Daewoo	May-07	Greece	Steam	GT NO 96	4	RasGas II
Al Karaana	210,100	Nakilat DSME 2284 Inc.	Daewoo	Oct-09	Marshall Is.	Diesel	GT NO 96	4	Qatargas III
Al Kharaitiyat	216,300	Nakilat HHI 1909 Inc.	HHI	Jun-09	Marshall Is.	Diesel	TZ Mk. III	4	Qatargas III
Al Kharsaah	217,000	Al Kharsaah Inc.	Samsung	Jun-08	Bahamas	Diesel	TZ Mk. III	10	RasGas III
Al Khattiya	210,150	Nakilat DSME 2283 Inc.	Daewoo	Jul-09	Marshall Is.	Diesel	GT NO 96	4	Qatargas IV
Al Khaznah	135,496	Al Khaznah Inc.	Mitsui E&S	Jul-94	Liberia	Steam	Moss	5	Das Island
Al Khor	137,354	Mitsui/Nippon/Kawasaki/lino	Mitsubishi	Nov-96	Japan	Steam	Moss	5	Qatargas I
Al Khuwair	217,000	Al Khuwair Inc.	Samsung	Jun-08	Bahamas	Diesel	TZ Mk. III	10	RasGas III
Al Mafyar	266,000	Nakilat SHI 1697 Inc.	Samsung	Apr-09	Marshall Is.	Diesel	TZ Mk. III	5	Qatargas III
Al Marrouna	149,539	Al Marrouna LLC	Daewoo	Sep-06	Bahamas	Steam	GT NO 96	4	RasGas II
Al Mayeda	266,000	Nakilat SHI 1694 Inc.	Samsung	Jan-09	Marshall Is.	Diesel	TZ Mk. III	5	Qatargas III
Al Nuaman	210,100	Nakilat DSME 2285 Inc.	Daewoo	Dec-09	Marshall Is.	Diesel	GT NO 96	4	Qatargas III
Al Oraiq	210,200	J5 Nakilat No. 3 Ltd.	Daewoo	Jun-08	Marshall Is.	Diesel	GT NO 96	18	RasGas III
Al Rayyan	137,420	Mitsui/Nippon/Kawasaki/lino	Kawasaki	Mar-97	Japan	Steam	Moss	5	Qatargas I
Al Rekayyat	216,293	Nakilat HHI 1910 Inc.	HHI	Jun-09	Marshall Is.	Diesel	TZ Mk. III	4	Qatargas III
Al Ruwais	210,150	Alexandra Neptana	Daewoo	Aug-07	Bahamas	Diesel	GT NO 96	4	Qatargas II
Al Sadd	210,200	Nakilat DSME 2265 Inc.	Daewoo	Mar-09	Marshall Is.	Diesel	GT NO 96	12	Qatargas III
Al Safliya	210,150	Britta Nausola	Daewoo	Sep-07	Bahamas	Diesel	GT NO 96	5	Qatargas II
Al Sahla	216,200	J5 Nakilat No. 5 Ltd.	HHI	Jun-08	Marshall Is.	Diesel	TZ Mk. III	4	RasGas III
Al Samriya	263,300	Nakilat Al Samriya Inc.	Daewoo	Feb-09	Marshall Is.	Diesel	GT NO 96	5	Qatargas II
Al Shamal	217,000	Al Shamal Inc.	Samsung	Apr-08	Bahamas	Diesel	TZ Mk. III	10	RasGas III
Al Sheehaniya	210,100	Nakilat DSME 2264 Inc.	Daewoo	Feb-09	Marshall Is.	Diesel	GT NO 96	12	Qatargas III
Al Thakhira	145,000	Peninsula LNG Transport No. 2	Samsung	Aug-05	Bahamas	Steam	TZ Mk. III	4	RasGas II
Al Thumama	216,200	J5 Nakilat No. 2 Ltd.	HHI	Feb-08	Marshall Is.	Diesel	TZ Mk. III	4	RasGas III
Al Utouriya	215,000	J5 Nakilat No. 8 Ltd.	HHI	Sep-08	Marshall Is.	Diesel	TZ Mk. III	4	RasGas III
Al Wajbah	137,308	Mitsui/Nippon/Kawasaki/lino	Mitsubishi	Jun-97	Japan	Steam	Moss	5	Qatargas I
Al Wakrah	137,371	Mitsui/Nippon/Kawasaki/lino	Kawasaki	Nov-98	Japan	Steam	Moss	5	Qatargas I
Al Zubarah	137,573	Mitsui/Nippon/Kawasaki/lino	Mitsui E&S	Nov-96	Japan	Steam	Moss	5	Qatargas I
Alto Acrux	147,798	Bahamas LNG Transport Ltd.	Mitsubishi	Mar-08	Bahamas	Steam	Moss	4	Darwin LNG
Amadi	154,800	BGC Four Nbd Sdn Bhd.	HHI	Jul-15	Brunei	DFDE	Membrane	4	Lumut
Amali	148,000	BGC Spv Nbd Sdn Bhd.	Daewoo	Aug-11	Brunei	DFDE	GT NO 96	4	Lumut
Amani	154,800	BGC Three Nbd Sdn Bhd.	HHI	Oct-14	Brunei	DFDE	Membrane	4	Lumut
Amberjack LNG	174,000	Xiang Ch17 HK International	HHI	Apr-20	Malta	X-DF	TZ MK. III Flex	4	Portfolio
Amur River	149,700	Seacrown Maritime Ltd.	HHI	Nov-07	Marshall Is.	Steam	TZ Mk. III	4	Sakhalin II
Arctic Aurora	155,000	Fareastern Shipping Ltd.	HHI	Jul-14	Malta	Diesel/Gas-Electric	TZ Mk. III	4	Snøhvit LNG
Arctic Discoverer	142,612	Northern LNG Trans Co. I Ltd.	Mitsui E&S	Feb-06	Bahamas	Steam	Moss	4	Hammerfest
Arctic Lady	147,200	Barents Leasing Ltd.	Mitsubishi	Apr-06	Norway	Steam	Moss	4	Hammerfest
Arctic Princess	147,200	Rb-Quadrangle Leasing Ltd.	Mitsubishi	Jan-06	Norway	Steam	Moss	4	Hammerfest
Arctic Spirit	89,800	Arctic Spirit LLC	Ishikawajima	Dec-93	Bahamas	Steam	IHI SPB	4	Atlantic LNG
Arctic Voyager	142,759	Northern LNG Trans Co. II Ltd.	Kawasaki	Jul-06	Bahamas	Steam	Moss	4	Hammerfest
Aristidis I	174,000	Capital Trading	HHI	Jan-21	Malta	X-DF	TZ Mk. III Flex	4	Portfolio
Aristos I	174,000	Xiang Ch25 HK International	HHI	Nov-20	Malta	X-DF	TZ Mk. III Flex	4	Portfolio
Arkat	148,000	BGC Spv Nbd Sdn Bhd.	Daewoo	Feb-11	Brunei	DFDE	GT NO 96	4	Lumut
Arwa Spirit	165,500	Membrane Shipping Ltd.	Samsung	Aug-08	Marshall Is.	Diesel/Gas-Electric	TZ Mk. III	4	Balhaf



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Aseem	155,003	India LNG Transport Co. No. 3	Samsung	Nov-09	Malta	Diesel	TZ Mk. III	4	RasGas
Asia Endeavour	160,000	Chevron Transport Corp. Ltd.	Samsung	Jun-15	Bahamas	Diesel/Gas-Electric	TZ MK. III	4	Gorgon
Asia Energy	154,800	Chevron Transport Corp. Ltd.	Samsung	Oct-14	Bahamas	DFDE	TZ MK. III	4	Gorgon
Asia Excellence	160,000	Chevron Transport Corp. Ltd.	Samsung	Feb-15	Bahamas	DFDE	TZ MK. III	4	Gorgon
Asia Integrity	160,000	Chevron Transport Corp. Ltd.	Samsung	Feb-17	Bahamas	DFDE	TZ Mk. III	4	Wheatstone
Asia Venture	160,000	Chevron Transport Corp. Ltd.	Samsung	Jul-17	Bahamas	Diesel/Gas-Electric	TZ Mk. III Flex	4	Wheatstone
Asia Vision	154,800	Chevron Transport Corp. Ltd.	Samsung	Jul-14	Bahamas	Diesel/Gas-Electric	TZ MK. III	4	Gorgon
Barcelona Knutsen	173,400	Norspan LNG V AS	Daewoo	Jan-10	Spain	Diesel/Gas-Electric	GT NO 96	4	Portfolio
Beidou Star	172,000	Capricorn LNG Shipping Ltd.	Hudong Zhonghua	Sep-15	Hong Kong	Diesel	TZ MK. III	4	PNG LNG
Berge Arzew	138,088	Berge Arzew/Sonatrach Berge	Daewoo	Jul-04	Bahamas	Steam	GT NO 96	4	Arzew
Bilbao Knutsen	138,000	Norspan LNG AS	Izar	Jan-04	Spain	Steam	GT NO 96	4	Portfolio
Bishu Maru	164,700	Trans Pacific Shipping 3 SA	Kawasaki	Dec-17	Panama	TFDE	Moss	4	Wheatstone
Bonito LNG	174,000	Xiang Ch18 HK International	HHI	May-20	Malta	X-DF	TZ MK. III Flex	4	Portfolio
Boris Davydov	172,410	Hai Kuo Shipping 1605 Ltd.	Daewoo	Dec-18	Cyprus	TFDE - Azipod	GT NO 96 GW	4	Yamal
Boris Vilkitsky	172,410	Hai Kuo Shipping 1601 Ltd.	Daewoo	Jun-17	Cyprus	TFDE - Azipod	GT NO 96 GW	4	Yamal
British Achiever	173,644	Ngoti No. 20 Spc B SA	Daewoo	Nov-18	Isle of Man	ME-GI	GT NO 96	4	Freeport
British Contributor	173,644	Hai Kuo Shipping 1533 Ltd.	Daewoo	Dec-18	Isle of Man	ME-GI	GT NO 96	4	Freeport
British Listener	173,644	Hai Kuo Shipping 1535 Ltd.	Daewoo	Jan-19	Isle of Man	ME-GI	GT NO 96	4	Freeport
British Mentor	173,644	Ngoti No. 20 Spc C SA	Daewoo	Mar-19	Isle of Man	ME-GI	GT NO 96	4	Freeport
British Partner	173,400	Ngoti No. 20 Spc A SA	Daewoo	Jun-18	Isle of Man	ME-GI	GT NO 96	4	Freeport
British Sapphire	155,000	Sg Leasing Gems Ltd.	HHI	Jun-08	Isle of Man	Diesel/Gas-Electric	TZ Mk. III	4	Portfolio
British Sponsor	173,644	Ngoti No. 20 Spc D SA	Daewoo	May-19	Isle of Man	ME-GI	GT NO 96	4	Freeport
Broog	137,529	Mitsui/Nippon/Kawasaki/Iino	Mitsui E&S	Apr-98	Japan	Steam	Moss	5	Qatargas I
Bu Samra	266,000	Nakilat Bu Samra Inc.	Samsung	Dec-08	Marshall Is.	DRL	TZ Mk. III	5	Qatargas II
Bushu Maru	180,000	Trans Pacific Shipping 6 Ltd.	Mitsubishi	Jul-19	Bahamas	Reheat Steam Turbine	TZ MK. III Flex	4	Sabine Pass
BW Boston	138,059	BW Gas Global LNG DA	Daewoo	Jan-03	Norway	Steam	GT NO 96	4	Atlantic LNG
BW Brussels	162,400	BW LNG IV Pte Ltd.	Daewoo	Aug-09	Singapore	Diesel/Gas-Electric	GT NO 96	4	Balhaf
BW Everett	138,028	Everett LNG Pte Ltd.	Daewoo	Jun-03	Singapore	Steam	GT NO 96	4	Atlantic LNG
BW Lilac	173,400	Helianthus Navigation Corp.	Daewoo	Mar-18	Malta	ME-GI	GT NO 96	4	Data unavailable
BW Magna	173,000	BW FSRU III Pte Ltd.	Daewoo	Mar-19	Sinapore	DFDE	TZ MK. III Flex	4	Data unavailable
BW Magnolia	173,400	Helen Navigation Pte Ltd.	Daewoo	Feb-20	Singapore	ME-GI	GT NO 96	4	Portfolio
BW Paris	162,400	BW FSRU IV Pte Ltd.	Daewoo	Jul-09	Sinapore	Diesel/Gas-Electric	GT NO 96	4	Balhaf
BW Pavilion Aranda	173,400	BW Diamond LNG Pte Ltd.	Daewoo	Sep-19	Singapore	ME-GI	TZ MK. III Flex	4	Portfolio
BW Pavilion Aranthera	173,400	BW Diamond LNG Pte Ltd.	Daewoo	Jul-20	Singapore	ME-GI	GT NO 96	4	Portfolio
BW Pavilion Leeara	158,629	BW Pavilion Leeara Pte Ltd.	HHI	Jun-15	Singapore	Diesel/Gas-Electric	Membrane	4	Portfolio
BW Pavilion Vanda	155,000	BW Pavilion Vanda Pte Ltd.	HHI	Feb-15	Singapore	DFDE	Membrane	4	Portfolio
BW Tatiana	135,269	FSRU Development Pte Ltd.	Mitsubishi	Dec-02	Marshall Is.	Steam	Moss	5	Atlantic LNG
BW Tulip	173,400	BW LNG I Pte Ltd.	Daewoo	Dec-17	Singapore	ME-GI	GT NO 96	4	Data unavailable
Cadiz Knutsen	138,826	Norspan LNG II As	Navantia	Apr-04	Spain	Steam	GT NO 96	4	Portfolio
Cape Ann	145,130	SRV Joint Gas Two Ltd.	Samsung	Apr-10	Norway	Diesel/Gas-Electric	TZ Mk. III	4	Jaigarh LNG
Castillo De Caldelas	176,300	La Arena Nav SA	Imabari Shipbuilding	Jun-18	Malta	ME-GI	TZ Mk. III Flex	4	Portfolio
Castillo de Merida	176,300	San Isidro LNG I BV	Imabari Shipbuilding	Mar-18	Malta	ME-GI	TZ MK. III Flex	4	Portfolio
Castillo de Santisteban	170,000	Trans Gas Naviera Aie	STX	Jun-10	Malta	Diesel Electric	GT NO 96	4	Portfolio
Castillo de Villalba	138,000	Trans Gas Naviera Aie	Navantia Cadiz	Sep-03	Spain	Steam	GT NO 96	4	Portfolio
Catalunya Spirit	138,000	Teekay Gas III SL	Izar	Jun-03	Spain	Steam	GT NO 96	4	Atlantic LNG
Celsius Canberra	180,000	Celsius Shipping	Samsung	Jan-21	Marshall Is.	X-DF	Membrane	4	Portfolio
Celsius Copenhagen	180,000	Greenheart Gas Shipco I LLC	Samsung	Nov-20	Marshall Is.	X-DF	TZ Mk. III Flex Plus	4	Portfolio
CESI Beihai	174,000	China Energy Aspiration LNG	Hudong Zhonghua	Jun-17	Hong Kong	TFDE	GT NO 96	4	APLNG
CESI Gladstone	174,000	China Energy Aspiration LNG	Hudong Zhonghua	Oct-16	Hong Kong	TFDE	GT NO 96	4	APLNG
CESI LianYungAng	174,000	China Energy Glory LNG	Hudong Zhonghua	Jun-18	Hong Kong	TFDE	GT NO 97	4	APLNG
CESI Qingdao	174,000	China Energy Hope LNG	Hudong Zhonghua	Feb-17	Hong Kong	TFDE	GT NO 96	4	APLNG
CESI Tianjin	174,000	China Energy Pioneer LNG	Hudong Zhonghua	Jul-17	Hong Kong	TFDE	GT NO 96	4	APLNG
CESI Wenzhou	174,000	China Energy Peace LNG	Hudong Zhonghua	Feb-18	Hong Kong	Diesel-Electric	GT NO 96	4	APLNG
Cheikh Bouamama	75,558	Skikda LNG Trans Corp.	Universal SB	Jul-08	Bahamas	Steam	TZ Mk. III	4	Arzew/Skikda
Cheikh El Mokrani	75,759	Mediterranean LNG Transport	Japan Marine United	Jun-07	Bahamas	Steam	TZ Mk. III	4	Skikda
Christophe de Margerie	170,000	Zelitko Shipping Co. Ltd.	Daewoo	Nov-16	Cyprus	Diesel/Gas-Electric	GT NO 96 GW	4	Yamal
Clean Energy	149,700	Pegasus Shipholding SA	HHI	Mar-07	Marshall Is.	Steam	TZ Mk. III	4	Portfolio
Clean Horizon	162,000	Sea 43 Leasing Co Ltd.	HHI	Apr-15	Malta	Diesel/Gas-Electric	Membrane	4	Portfolio
Clean Ocean	162,000	Cdbl Ocean Ltd.	HHI	May-14	Marshall Is.	Diesel/Gas-Electric	Membrane	4	Sabine Pass
Clean Planet	162,000	Cdbl Planet Ltd.	HHI	Aug-14	Marshall Is.	Diesel Electric	Membrane	4	Yamal
Clean Vision	162,000	Sea 44 Leasing Co. Ltd.	HHI	Aug-15	Malta	Diesel/Gas-Electric	TZ Mk. III	4	Portfolio
CNTIC VPower Global	28,260	CNTIC VPower LNG Logistics	COSCO (Dalian) Shipyard Co.	Apr-20	Hong Kong	Diesel/Gas-Electric	GT NO 96	4	Portfolio
Cool Discoverer	174,000	Serendipity Maritime Ltd.	HHI	Sep-20	Malta	X-DF	TZ MK. III Flex	4	Portfolio
Cool Explorer	160,000	Safe Port Marine Ltd.	Samsung	Jan-15	Malta	DFDE	TZ Mk. III	4	Spot
Cool Racer	174,000	Eloquent Shipping	Samsung	Feb-21	Malta	X-DF	TZ Mk. III Flex	4	Portfolio
Cool Runner	160,000	Priority Maritime Corp.	Samsung	Mar-14	Malta	Diesel Electric	TZ Mk. III	4	Wheatstone
Cool Voyager	160,000	Energy Shipping & Trading SA	Samsung	Oct-13	Malta	TFDE	TZ Mk. III	4	Wheatstone
Coral Encanto	30,000	Maxluck Plus Ltd.	Ningbo Xinle	Jul-20	Marshall Is.	DFDE	Cylinders	2	Portfolio



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Corcovado LNG	160,162	Oceanus LNG Alpha LLC	Daewoo	Apr-14	Malta	Diesel Electric	GT NO 96	4	Spot
Creole Spirit	173,400	Hai Jiao 1601 Ltd.	Daewoo	Feb-16	Bahamas	ME-GI	GT NO 96	4	Sabine Pass
Cubal	160,276	Mint LNG IV Ltd.	Samsung	Jan-12	Bahamas	DFDE	TZ Mk. III	4	Soyo
Cygnus Passage	145,400	Cygnus LNG Shipping Ltd.	Mitsubishi	Jan-09	Bahamas	Steam	Moss	4	Sakhalin II
Dapeng Moon	147,200	Yue Gang LNG Shipping Co. Ltd.	Hudong Zhonghua	Jul-08	Hong Kong	Steam	TZ MK. III	4	Pluto
Dapeng Star	147,210	Yue Yang LNG Shipping Co. Ltd.	Hudong Zhonghua	Nov-09	Hong Kong	Steam	TZ MK. III	4	Pluto
Dapeng Sun	147,200	Yue Peng LNG Shipping Co. Ltd.	Hudong Zhonghua	Apr-08	Hong Kong	Steam	GT NO 96	4	North West Shelf
Diamond Gas Metropolis	174,000	Diamond LNG Shipping 4 Ltd.	HHI	Nov-20	Bahamas	X-DF	TZ Mk. III Flex	4	Portfolio
Diamond Gas Orchid	165,000	Diamond LNG Shipping 1 Pte Ltd.	Mitsubishi	Jun-18	Bahamas	STaGE	Sayaringo	4	Cameron
Diamond Gas Rose	165,000	Diamond LNG Shipping 2 Pte Ltd.	Mitsubishi	Aug-18	Bahamas	STaGE	Sayaringo	4	Cameron
Diamond Gas Sakura	165,000	Diamond LNG Shipping 3 Pte Ltd.	Japan Marine United	May-19	Bahamas	STaGE	Sayaringo	4	Cameron
Disha	136,025	India LNG Transport Co. No. 1	Daewoo	Dec-03	Malta	Gas Turbine	GT NO 96	4	RasGas
Doha	137,262	Mitsui/Nippon/Kawasaki/Iino	Mitsubishi	Jun-99	Japan	Steam	Moss	5	Qatargas I
Dorado LNG	174,000	Cardiff LNG Epsilon Owning LLC	Samsung	Dec-20	Malta	X-DF	TZ Mk. III Flex	4	Portfolio
Duhail	210,150	Gabriela Nauranto	Daewoo	Dec-07	Bahamas	Diesel	GT NO 96	4	Qatargas II
Dukhan	137,661	LNG Water Lily Shipping Corp.	Mitsui E&S	Sep-04	Liberia	Steam	Moss	5	Qatargas II
East Energy	122,255	Sinokor Maritime Co. Ltd.	STX	Aug-82	South Korea	Steam	Membrane	4	NLNG
Eduard Toll	172,410	TC LNG Explorer I LLC	Daewoo	Sep-17	Bahamas	TFDE - Azipod	GT NO 96 GW	4	Yamal
Ejnan	145,000	Peninsula LNG Transport No. 4	Samsung	Jan-07	Bahamas	Steam	TZ Mk. III	4	RasGas II
Ekaputra	136,400	Hikmah Sarana Bahari Pt.	Mitsubishi	Jan-89	Indonesia	Steam	Moss	5	Bontang
Elisa Larus	174,000	Caroline 77 Sasu	Hyundai Samho	May-20	France	X-DF	TZ Mk. III Flex Plus	4	Portfolio
Energy Advance	147,624	Tokyo LNG Tanker/Toho LNG	Kawasaki	Mar-05	Japan	Steam	Moss	4	Portfolio
Energy Atlantic	156,000	Spectacle Shipping & Trading	STX	Sep-15	Malta	TFDE	Moss	4	Sabine Pass
Energy Confidence	153,000	Tokyo LNG Tanker/Nippon Yusen	Kawasaki	Apr-09	Japan	Steam	Moss	4	Darwin LNG
Energy Endeavour	173,400	Rossini Navigation SA	Daewoo	Jan-21	Marshall Is.	ME-GI	TZ Mk. III Flex	4	0
Energy Frontier	147,599	Tokyo LNG Tanker Co. Ltd.	Kawasaki	Sep-03	Japan	Steam	Moss	4	Sakhalin II
Energy Glory	165,000	Tokyo LNG Tanker/Nippon Yusen	Japan Marine United	Mar-19	Japan	TFDE	TZ Mk. III Flex Plus	4	Cove Point
Energy Horizon	177,000	Tokyo LNG Tanker/Nippon Yusen	Kawasaki	Aug-11	Japan	Steam	Moss	4	Pluto
Energy Innovator	165,000	Tokyo LNG Tanker/Mitsui OSK	Japan Marine United	Jun-19	Japan	TFDE	TZ Mk. III Flex Plus	4	Cove Point
Energy Liberty	165,000	Tokyo LNG Tanker/Mitsui OSK	Japan Marine United	Oct-18	Japan	TFDE	TZ Mk. III Flex Plus	4	Cove Point
Energy Navigator	145,000	Tokyo LNG Tanker/Mitsui OSK	Kawasaki	May-08	Japan	Steam	Moss	4	Sakhalin II
Energy Pacific	173,400	Ravel Navigation SA	Daewoo	Aug-20	Marshall Is.	ME-GI	TZ Mk. III Flex	4	Portfolio
Energy Progress	147,558	Jovial Shipping Navigation SA	Kawasaki	Nov-06	Bahamas	Steam	Moss	4	Darwin LNG
Energy Universe	166,571	Lusby Shipping SA	Japan Marine United	Aug-19	Panama	TFDE	TZ Mk. III Flex	4	Cove Point
Enshu Maru	164,700	Trans Pacific Shipping 4 SA	Kawasaki	Aug-18	Panama	Reheat Steam Turbine	Moss	4	Wheatstone
Esshu Maru	153,000	Trans Pacific Shipping 2 Ltd.	Mitsubishi	Dec-14	Bahamas	Steam	Sayaendo	4	Portfolio
Etyfa Prometheas	135,269	Enlink Trading FZE	Mitsubishi	Oct-02	Cyprus	Steam	Moss	5	Portfolio
Excalibur	138,034	Solaia Shipping LLC	Daewoo	May-02	Belgium	Steam	GT NO 96	4	Portfolio
Fedor Litke	172,410	Hai Kuo Shipping 1602 Ltd.	Daewoo	May-17	Cyprus	TFDE - Azipod	GT NO 96 GW	4	Yamal
Flex Amber	174,000	Bund 10 Holding Ltd.	HHI	Oct-20	Marshall Is.	X-DF	TZ Mk. III Flex	4	Portfolio
Flex Artemis	174,000	Flex LNG Reliance Ltd.	Daewoo	Aug-20	Marshall Is.	ME-GI	NO-96-GW+FRS	4	Portfolio
Flex Aurora	174,000	Flex LNG Aurora Ltd.	HHI	Jun-20	Marshall Is.	X-DF	TZ Mk. III Flex	4	Portfolio
Flex Constellation	173,400	Flex LNG Constellation Ltd.	Daewoo	Jun-19	Marshall Is.	ME-GI	NO-96-GW+PRS	4	Data unavailable
Flex Courageous	173,400	Flex LNG Courageous Ltd.	Daewoo	Aug-19	Marshall Is.	ME-GI	NO-96-GW+PRS	4	Data unavailable
Flex Endeavour	172,400	Triple H No. 3 Ltd.	Daewoo	Jan-18	Malta	ME-GI	NO-96-GW+PRS	4	Portfolio
Flex Enterprise	172,400	Triple H No. 4 Ltd.	Daewoo	Jan-18	Malta	ME-GI	NO-96-GW+PRS	4	Data unavailable
Flex Freedom	173,400	Flex Freedom Ltd.	HHI	Jan-21	Marshall Is.	ME-GI	NO-96-GW+FRS	4	Portfolio
Flex Rainbow	174,000	Xiang Ch13 HK International	Samsung	Jun-18	Marshall Is.	ME-GI	TZ Mk. III Flex	4	Spot
Flex Ranger	174,101	Flex LNG Ranger Ltd.	Samsung	Jun-18	Marshall Is.	ME-GI	TZ Mk. III Flex	4	Portfolio
Flex Resolute	173,400	Flex LNG Resolute Ltd.	HHI	Sep-20	Marshall Is.	ME-GI	NO-96-GW+FRS	4	Portfolio
Fraiha	210,100	J5 Nakilat No. 6 Ltd.	Daewoo	Aug-08	Marshall Is.	Diesel	GT NO 96	18	RasGas III
Fuji LNG	149,172	Aletheia Owning Co Ltd.	Kawasaki	Mar-04	Malta	Steam	Moss	4	Sabine Pass
Fuwairit	138,200	Camartina Shipping Co.	Samsung	Jan-04	Bahamas	Steam	TZ Mk. III	4	RasGas II
Galicia Spirit	140,624	Teekay Gas II SL	Daewoo	Jul-04	Spain	Steam	GT NO 96	4	Portfolio
Gaslog Chelsea	153,000	Gas-Fifteen Ltd.	Hanjin (Busan)	Jun-10	Bermuda	Diesel/Gas-Electric	Sayaendo	4	Portfolio
Gaslog Galveston	170,520	GasLog LNG Services	Samsung	Jan-21	Bermuda	X-DF	Membrane	4	Portfolio
Gaslog Geneva	174,000	Gas-Thirteen Ltd.	Samsung	Oct-16	Bermuda	TFDE	TZ Mk. III	4	Portfolio
Gaslog Genoa	174,000	Gas-Twenty Two Ltd.	Samsung	Mar-18	Bermuda	X-DF	TZ Mk. III Flex Plus	4	Portfolio
GasLog Georgetown	174,000	Ceres Shipping Ltd.	Samsung	Nov-20	Bermuda	X-DF	Membrane	4	Portfolio
Gaslog Gibraltar	174,000	Gas-Fourteen Ltd.	Samsung	Nov-16	Bermuda	TFDE	TZ Mk. III	4	Portfolio
Gaslog Gladstone	174,000	Gas-Twenty Three Ltd.	Samsung	Mar-19	Bermuda	X-DF	TZ Mk. III Flex Plus	4	Portfolio
Gaslog Glasgow	174,000	Gas-Twelve Ltd.	Samsung	Jul-16	Bermuda	TFDE	TZ Mk. III	4	Portfolio
Gaslog Greece	174,000	Gas-Eleven Ltd.	Samsung	Mar-16	Bermuda	TFDE	TZ Mk. III	4	Portfolio
Gaslog Hong Kong	174,000	Gas-Twenty Five Ltd.	HHI	Mar-18	Bermuda	X-DF	TZ Mk. III Flex	4	Portfolio
Gaslog Houston	174,000	Gas-Twenty Four Ltd.	HHI	Dec-18	Bermuda	X-DF	TZ Mk. III Flex	4	GoM
Gaslog Salem	155,000	Gas-Ten Ltd.	Samsung	May-15	Bermuda	Diesel/Gas-Electric	Membrane	4	Portfolio
Gaslog Santiago	155,000	Gas-Four Ltd.	Samsung	Mar-13	Bermuda	Diesel/Gas-Electric	TZ Mk. III	4	Portfolio
Gaslog Saratoga	155,000	Gas-Nine Ltd.	Samsung	Dec-14	Bermuda	Diesel/Gas-Electric	Membrane	4	Spot
Gaslog Savannah	155,000	Gas-One Ltd.	Samsung	May-10	Bermuda	Diesel	TZ Mk. III	4	Portfolio



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Gaslog Seattle	155,000	Gas-Seven Ltd.	Samsung	Oct-13	Bermuda	TFDE	TZ Mk. III	4	Portfolio
Gaslog Shanghai	155,000	Gas-Three Ltd.	Samsung	Feb-13	Bermuda	Diesel/Gas-Electric	TZ Mk. III	4	Portfolio
Gaslog Singapore	155,000	Gas-Two Ltd.	Samsung	Aug-10	Bermuda	Diesel/Gas-Electric	TZ Mk. III	4	Portfolio
GasLog Skagen	155,000	Gas-Six Ltd.	Samsung	Aug-13	Bermuda	TFDE	TZ Mk. III	4	Portfolio
Gaslog Sydney	155,000	Gas-Five Ltd.	Samsung	Jun-13	Bermuda	DFDE	TZ Mk. III	4	Portfolio
Gaslog Wales	180,000	Gas-Thirty One Ltd.	Samsung	May-20	Bermuda	X-DF	TZ Mk. III Flex Plus	4	Portfolio
Gaslog Warsaw	180,000	GasLog Hellas-1 ENE	Samsung	Jul-19	Greece	X-DF	TZ Mk. III Flex Plus	4	Spot
Gaslog Westminster	180,000	Gas-Thirty Ltd.	Samsung	Jul-20	Bermuda	X-DF	TZ Mk. III Flex Plus	4	Portfolio
Gaslog Windsor	180,000	Gas-Twenty Eight Ltd.	Samsung	Apr-20	Bermuda	X-DF	TZ MK. V	4	Portfolio
Gemmata	135,269	National Australia Finance	Mitsubishi	Feb-04	Singapore	Steam	Moss	5	Peru LNG
Georgiy Brusilov	172,410	Hai Kuo Shipping 1801 Pte Ltd.	Daewoo	Nov-18	Cyprus	TFDE - Azipod	GT NO 96 GW	4	Yamal
Georgiy Ushakov	172,652	DY Tankers Ltd.	Daewoo	Sep-19	Bahamas	ME-GI	GT NO 96 GW	4	Yamal
Ghasha	137,000	Ghasha Inc.	Mitsui E&S	Jun-95	Liberia	Steam	Moss	5	Das Island
Gigira Laitebo	177,419	Cleopatra LNG Shipping Co. Ltd.	HHI	Feb-10	Bahamas	DFDE	TZ Mk. III	4	RasGas
Global Energy	74,100	Global Energy Armateur SNC	STX	Jan-04	France	Diesel/Gas-Electric	CS1	4	Portfolio
Global Energy	74,100	Global Energy International	STX	Jan-04	Marshall Is.	Diesel/Gas-Electric	CS1	4	Portfolio
Global Star	173,400	Global Star Inc.	Daewoo	Jan-21	Marshall Is.	ME-GI	TZ Mk. III Flex	4	Portfolio
Golar Arctic	140,648	Golar LNG 2216 Corp.	Daewoo	Oct-03	Marshall Is.	Steam	GT NO 96	4	Jamaica LNG
Golar Bear	160,000	Cool Bear Shipping Ltd.	Samsung	Sep-14	Marshall Is.	Diesel/Gas-Electric	TZ Mk. III	4	Spot
Golar Celsius	160,000	Noble Celsius Shipping Ltd.	Samsung	Oct-13	Marshall Is.	Diesel/Gas-Electric	TZ Mk. III	4	Spot
Golar Crystal	159,800	Oriental Fleet LNG 01 Ltd.	Samsung	Sep-14	Marshall Is.	TFDE	Membrane	4	Spot
Golar Frost	160,000	Golar LNG NB12 Corp.	Samsung	Oct-14	Marshall Is.	Diesel/Gas-Electric	Membrane	4	Portfolio
Golar Glacier	162,000	Hai Jiao 1401 Ltd.	Hyundai Samho	Nov-14	Marshall Is.	TFDE	Membrane	4	Spot
Golar Grand	145,700	Golar Grand Corp.	Daewoo	Jan-06	Marshall Is.	Steam	GT NO 96	4	Gorgon
Golar Ice	160,000	Hai Jiao 1406 Ltd.	Samsung	Jan-15	Marshall Is.	Diesel Electric	Membrane	4	Spot
Golar Kelvin	162,000	Hai Jiao 1405 Ltd.	Hyundai Samho	Jan-15	Marshall Is.	DFDE	Membrane	4	Spot
Golar Maria	145,700	Golar LNG 2234 LLC	Daewoo	Jun-06	Marshall Is.	Steam	GT NO 96	4	Spot
Golar Mazo	135,255	Faraway Maritime Shipping	Mitsubishi	Dec-99	Liberia	Steam	Moss	5	Bontang
Golar Penguin	160,000	Oriental Fleet LNG 02 Ltd.	Samsung	Sep-14	Marshall Is.	TFDE	Membrane	4	Spot
Golar Seal	160,000	Compass Shipping 1 Corp. Ltd.	Samsung	Sep-13	Marshall Is.	Diesel/Gas-Electric	TZ Mk. III	4	Spot
Golar Snow	160,000	Hai Jiao 1402 Ltd.	Samsung	Jan-15	Marshall Is.	Diesel/Gas-Electric	Membrane	4	Spot
Grace Acacia	149,700	Algawin Shipping Inc.	HHI	Feb-07	Bahamas	Steam	TZ Mk. III	4	Spot
Grace Barleria	149,700	NYK Line	HHI	Apr-07	Japan	Steam	TZ Mk. III	4	Portfolio
Grace Cosmos	150,000	Algahunt Shipping Inc.	HHI	Feb-08	Bahamas	Steam	TZ Mk. III	4	Portfolio
Grace Dahlia	177,000	NYK Line	Kawasaki	Sep-13	Japan	Steam	Moss	4	Spot
Grand Aniva	145,000	NYK-SCF LNG Shpg No. 2 Ltd.	Mitsubishi	Jan-08	Cyprus	Steam	Moss	4	Sakhalin II
Grand Elena	145,580	NYK-SCF LNG Shpg No. 1 Ltd.	Mitsubishi	Oct-07	Cyprus	Steam	Moss	4	Sakhalin II
Grand Mereya	147,000	Ice Gas LNG Shipping Co. Ltd.	Mitsui E&S	Mar-08	Cyprus	Steam	Moss	4	Sakhalin II
Hanjin Muscat	138,366	H-Line Shipping Co. Ltd.	Hanjin (Busan)	Jul-99	South Korea	Steam	GT NO 96	4	Oman LNG
Hanjin Pyeongtaek	130,636	H-Line Shipping Co. Ltd.	Hanjin (Busan)	Sep-95	South Korea	Steam	GT NO 96	4	Bontang
Hanjin Ras Laffan	138,214	H-Line Shipping Co. Ltd.	Hanjin (Busan)	Jul-00	South Korea	Steam	GT NO 96	4	RasGas I
Hanjin Sur	138,333	H-Line Shipping Co. Ltd.	Hanjin (Busan)	Feb-00	South Korea	Steam	GT NO 96	4	Oman LNG
Hispania Spirit	145,500	Teekay Gas Naviera SL	Daewoo	Aug-02	Spain	Steam	GT NO 96	4	Peru LNG
Hoegh Giant	165,000	Hoegh LNG Giant Ltd.	HHI	Jan-17	Marshall Is.	Diesel/Gas-Electric	TZ MK. III Flex	4	Portfolio
Hongkong Energy	138,000	Ocean Trinity Sh No. 27 SA	Daewoo	Feb-04	Marshall Is.	Steam	GT NO 96	4	North West Shelf
Hyundai Aquapia	137,415	Hyundai LNG Shipping Co. Ltd.	HHI	May-00	South Korea	Steam	Moss	4	Oman LNG
Hyundai Cosmopia	137,415	Hyundai LNG Shipping Co. Ltd.	HHI	Feb-00	South Korea	Steam	Moss	4	RasGas I
Hyundai Ecopia	149,745	KLT 1 International SA	HHI	Nov-08	Panama	Steam	TZ Mk. III	4	Balhaf
Hyundai Greenpia	125,000	Hyundai LNG Shipping Co. Ltd.	HHI	May-96	South Korea	Steam	Moss	4	MLNG
Hyundai Oceanpia	135,000	Hyundai LNG Shipping Co. Ltd.	HHI	Jun-00	South Korea	Steam	Moss	4	Oman LNG
Hyundai Peacepia	174,000	Hlb SA	Daewoo	Jun-17	Panama	ME-GI	TZ Mk. III Flex	4	Sabine Pass
Hyundai Princepia	174,000	Hla SA	Daewoo	May-17	Panama	ME-GI	TZ Mk. III Flex	4	Sabine Pass
Hyundai Technopia	137,415	Hyundai LNG Shipping Co. Ltd.	HHI	Jul-99	South Korea	Steam	Moss	4	RasGas I
Hyundai Utopia	125,182	Hyundai LNG Shipping Co. Ltd.	HHI	Jun-94	South Korea	Steam	Moss	4	Donggi Senoro
Iberica Knutsen	138,000	Norspan LNG III AS	Daewoo	Aug-06	Norway	Ultra Steam Turbine	GT NO 96	4	Portfolio
Ibra LNG	147,000	Areej LNG Carrier SA	Samsung	Jul-06	Panama	Steam	TZ Mk. III	4	Oman LNG
Ibri LNG	147,569	Dune LNG Carrier SA	Mitsubishi	Jul-06	Panama	Steam	Moss	4	Oman LNG
Ish	137,000	Ish Inc.	Mitsubishi	Nov-95	Liberia	Steam	Moss	5	Das Island
K. Acacia	138,017	Korea Line LNG Co. Ltd.	Daewoo	Dec-99	South Korea	Steam	GT NO 96	4	Oman LNG
K. Freesia	138,015	Korea Line LNG Co. Ltd.	Daewoo	Aug-00	South Korea	Steam	GT NO 96	4	RasGas I
K. Jasmine	145,878	Kolt JV No. 1 SA	Daewoo	May-08	Panama	Steam	TZ MK. III	4	Sakhalin II
K. Mugungwha	151,812	Kolt JV No. 2 SA	Daewoo	Nov-08	Panama	Steam	TZ MK. III	4	Oman LNG
Kinisis	173,400	Danae Gas Shipping Inc.	Daewoo	Oct-18	Liberia	ME-GI	TZ Mk. III Flex	4	Portfolio
Kita LNG	147,895	Oceanus LNG Beta LLC	Daewoo	May-14	Malta	Diesel Electric	GT NO 96	4	Spot
Kmarin Diamond	155,000	Sg Leasing Gems Ltd.	Hyundai Samho	Jul-08	Isle of Man	Diesel/Gas-Electric	TZ Mk. III	4	Portfolio
Kmarin Emerald	155,000	Sg Leasing Gems Ltd.	HHI	May-07	Isle of Man	DFDE	TZ Mk. III	4	Portfolio
Kumul	170,000	Gemini LNG Shipping Ltd.	Hudong Zhonghua	Dec-15	Hong Kong	Diesel	TZ MK. III	4	PNG LNG
La Mancha Knutsen	176,300	Norspan LNG IX AS	HHI	Sep-16	Spain	ME-GI	Membrane	4	Portfolio



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La Seine	174,000	Xiang Ch16 HK International	HHI	Feb-20	Malta	X-DF	TZ MK. III Flex	4	Portfolio
Lalla Fatma N'Soumer	145,000	Algeria Nippon Gas	Kawasaki	Oct-04	Bahamas	Steam	Moss	4	Arzew
Lena River	155,000	Solana Holding Ltd.	HHI	Sep-13	Marshall Is.	DFDE	TZ Mk. III	4	Portfolio
Lijmiliya	263,300	Nakilat Lijmiliya Inc.	Daewoo	Dec-08	Marshall Is.	Diesel	GT NO 96	5	Qatargas II
LNG Abalamabie	162,000	Bonny Gas Transport Ltd.	Samsung	Jul-16	Bermuda	DFDE	TZ Mk. III	4	NLNG
LNG Abuja II	162,000	Bonny Gas Transport Ltd.	Samsung	Mar-16	Bermuda	DFDE	TZ Mk. III	4	NLNG
LNG Adamawa	141,000	Bonny Gas Transport Ltd.	HHI	Apr-05	Bermuda	Steam	Moss	4	NLNG
LNG Akwa Ibom	141,000	Bonny Gas Transport Ltd.	HHI	Oct-04	Bermuda	Steam	Moss	4	NLNG
LNG Alliance	154,472	NYK Armateur	STX	Mar-07	France	Diesel/Gas-Electric	CS1	4	Portfolio
LNG Aquarius	126,300	Hanochem Shipping Pt.	General Dynamics	Jan-77	Indonesia	Steam	Moss	5	Bontang
LNG Barka	155,982	Lloyds TSB General Leasing 3	Kawasaki	Dec-08	Bahamas	Steam	Moss	4	Oman LNG
LNG Bayelsa	137,500	Bonny Gas Transport Ltd.	HHI	Mar-03	Bermuda	Steam	Moss	4	NLNG
LNG Benue	145,952	BW Gas LNG Carriers Pte Ltd.	Daewoo	Apr-06	Bermuda	Steam	GT NO 96	4	NLNG
LNG Bonny li	174,000	Bonny Gas Transport Ltd.	HHI	Dec-15	Bermuda	Diesel/Gas-Electric	TZ Mk. III	4	NLNG
LNG Borno	149,600	Okra Shipping No. 1	Samsung	Aug-07	Bermuda	Steam	TZ Mk. III	4	NLNG
LNG Cross River	141,000	Bonny Gas Transport Ltd.	HHI	Aug-05	Bermuda	Steam	Moss	4	NLNG
LNG Dream	145,000	OJV Cayman 1 Ltd.	Kawasaki	Sep-06	Bahamas	Steam	Moss	4	North West Shelf
LNG Dubhe	174,000	Arctic Red LNG Shipping Ltd.	Hudong Zhonghua	Nov-19	Hong Kong	ME-GI	GTT NO96 L03+	4	Yamal
LNG Ebisu	147,546	LNG Ebisu Shipping Corp.	Kawasaki	Jul-08	Bahamas	Steam	Moss	4	Pluto
LNG Enugu	145,926	BW Gas LNG Carriers Pte Ltd.	Daewoo	Oct-05	Bermuda	Steam	GT NO 96	4	NLNG
LNG Finima II	162,000	Bonny Gas Transport Ltd.	Samsung	Dec-15	Bermuda	DFDE	TZ Mk. III	4	NLNG
LNG Fukurokuju	164,700	LNG Fukurokuju Shipping Corp. .	Kawasaki	Jul-16	Bahamas	Steam	Moss	4	APLNG
LNG Imo	148,452	Bergesen LNG XI Pte Ltd.	Daewoo	Jun-08	Bermuda	Steam	GT NO 96	4	NLNG
LNG Jamal	135,333	Jamal Shipholding SA	Mitsubishi	Oct-00	Japan	Steam	Moss	5	Oman LNG
LNG Juno	180,000	Mog-X LNG Shipholding SA	Mitsubishi	Oct-18	Bahamas	STaGE	Moss	4	Freeport
LNG Jupiter	153,000	Lloyds TSB Equipment No. 7 Ltd.	Kawasaki	Jul-09	Bahamas	Steam	Moss	4	PNG LNG
LNG Jurojin	160,000	LNG Jurojin Shipping Corp. .	Mitsubishi	Nov-15	Bahamas	Steam	Moss	4	Portfolio
LNG Kano	148,565	Bergesen LNG IX Pte Ltd.	Daewoo	Jan-07	Bermuda	Steam	TZ MK. III	4	NLNG
LNG Kolt	153,595	KLT 5 International SA	Hanjin (Busan)	Dec-08	Panama	Steam	TZ Mk. III	4	Portfolio
LNG Lagos II	174,000	Bonny Gas Transport Ltd.	HHI	Jan-16	Bermuda	DFDE	TZ Mk. III	4	NLNG
LNG Lerici	65,000	Portovenere & Lerici Pte Ltd.	Sestri Ponente	Apr-98	Singapore	Steam	GT NO 96	4	Malaysia LNG
LNG Lokoja	148,471	Bergesen LNG VIII Pte Ltd.	Daewoo	Nov-06	Bermuda	Steam	GT NO 96	4	NLNG
LNG Maleo	127,544	Nippon/Mitsui/Kawasaki	Mitsui E&S	Jan-89	Japan	Steam	Moss	4	North West Shelf
LNG Mars	155,693	Osaka Gas Int. & Mitsui OSK	Mitsubishi	Oct-16	Japan	Steam	Moss	4	PNG LNG
LNG Megrez	174,000	Arctic Indigo LNG Shipping Ltd.	Hudong Zhonghua	Nov-20	Hong Kong	ME-GI	GTT NO96 L03+	4	Yamal
LNG Merak	174,000	Arctic Yellow LNG Shipping Ltd.	Hudong Zhonghua	Jan-20	Hong Kong	ME-GI	GTT NO96 L03+	4	Yamal
LNG Ogun	149,000	Okra Shipping No. 2	Samsung	Jul-07	Bermuda	Steam	TZ Mk. III	4	NLNG
LNG Ondo	148,478	Bergesen LNG X Pte Ltd.	Daewoo	Sep-07	Bermuda	Steam	TZ MK. III	4	NLNG
LNG Oyo	145,842	BW Gas LNG Carriers Pte Ltd.	Daewoo	Jan-06	Bermuda	Steam	GT NO 96	4	NLNG
LNG Phecda	174,000	Arctic Orange LNG Shipping Ltd.	Hudong Zhonghua	Sep-20	Hong Kong	ME-GI	GTT NO96 L03+	4	Yamal
LNG Pioneer	138,121	M&S Shipping 3 SA	Daewoo	Jul-05	Bahamas	Steam	GT NO 96	4	Das Island
LNG Port-Harcourt II	162,000	Bonny Gas Transport Ltd.	Samsung	Dec-15	Bermuda	DFDE	TZ Mk. III	4	NLNG
LNG Portovenere	65,000	Portovenere & Lerici Pte Ltd.	Sestri Ponente	Apr-97	Singapore	Steam	GT NO 96	4	Portfolio
LNG River Niger	141,000	Bonny Gas Transport Ltd.	HHI	Jul-06	Bermuda	Steam	Moss	4	NLNG
LNG River Orashi	145,914	BW Gas LNG Carriers Pte Ltd.	Daewoo	Nov-04	Bermuda	Steam	GT NO 96	4	NLNG
LNG Rivers	137,200	Bonny Gas Transport Ltd.	HHI	Jun-02	Bermuda	Steam	Moss	4	NLNG
LNG Rosenrot	176,523	MOL	DSME	Jan-21	Marshall Is.	X-DF	Membrane	4	Portfolio
LNG Sakura	177,000	LNG Sakura Shipping Corp.	Kawasaki	Feb-18	Bahamas	TFDE	Moss	4	Freeport
LNG Saturn	155,300	Mog-IX LNG Shipholding SA	Mitsubishi	Feb-16	Bahamas	Ultra Steam Turbine	Moss	4	Gorgon
LNG Schneeweisschen	180,000	LNG Rose Shipping Corp.	Daewoo	Sep-18	Panama	TFDE	TZ Mk. III Flex	4	Freeport
LNG Sokoto	137,425	Bonny Gas Transport Ltd.	HHI	Sep-02	Bermuda	Steam	Moss	4	NLNG
LNG Unity	154,472	Global LNG Armateur SAS	STX	Nov-06	France	Diesel/Gas-Electric	CS1	4	Portfolio
LNG Venus	153,000	Osaka Gas Int. & Mitsui OSK	Mitsubishi	Nov-14	Japan	Steam	Sayaendo	4	North West Shelf
LNG Vesta	127,386	Europe LNGT Co. Ltd.	Mitsubishi	Jun-94	Liberia	Steam	Moss	4	Portfolio
Lobito	160,276	Mint LNG III Ltd.	Samsung	Nov-11	Bahamas	DFDE	TZ Mk. III	4	Soyo
Lusail	145,000	Peninsula LNG Transport No. 1	Samsung	May-05	Bahamas	Steam	TZ Mk. III	4	RasGas II
Macoma	145,400	Compass Shipping 9 Corp. Ltd.	Daewoo	Sep-17	Bahamas	ME-GI	GT NO 96	4	Portfolio
Madrid Spirit	138,000	Teekay Gas IV SL	Navantia	Dec-04	Spain	Steam	GT NO 96	4	Atlantic LNG
Magdala	173,400	Hai Jiao 1606 Ltd.	Daewoo	Feb-18	Bahamas	ME-GI	GT NO 96	4	Portfolio
Magellan Spirit	165,500	Magellan Spirit Aps	Samsung	Apr-09	Denmark	Diesel/Gas-Electric	TZ Mk. III	4	Portfolio
Malanje	160,276	Mint LNG II Ltd.	Samsung	Oct-11	Bahamas	DFDE	TZ Mk. III	4	Soyo
Maran Gas Achilles	174,000	Adonis Investment Corp.	Hyundai Samho	Jan-16	Greece	DFDE	TZ Mk. III	4	Portfolio
Maran Gas Agamemnon	174,000	Doris Navigation Inc.	Hyundai Samho	May-16	Greece	DFDE	TZ Mk. III	4	Portfolio
Maran Gas Alexandria	161,870	Greenmare Navigation Corp.	Hyundai Samho	Oct-15	Greece	DFDE	Membrane	4	QCLNG
Maran Gas Amphipolis	174,000	Nestor Navigation Corp.	Daewoo	Aug-16	Greece	DFDE	Membrane	4	Portfolio
Maran Gas Andros	173,400	Crusandel Marine Co.	Daewoo	Nov-19	Greece	ME-GI	GT NO 96	4	Freeport
Maran Gas Apollonia	161,870	Ilida Shipping Co. Ltd.	Hyundai Samho	Jan-14	Greece	Diesel Electric	TZ Mk. III	4	Punta Europa
Maran Gas Asclepius	145,000	Sea Satin Corp.	Daewoo	Jul-05	Greece	Steam	GT NO 96	4	RasGas II



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Maran Gas Chios	170,000	Pleione Inc.	Daewoo	Mar-19	Greece	ME-GI	TZ Mk. III Flex	4	Data unavailable
Maran Gas Coronis	145,700	Jopica Shipping Co.	Daewoo	Jul-07	Greece	Steam	TZ MK. III	4	RasGas II
Maran Gas Delphi	159,800	Ada Shipholding Inc.	Daewoo	Feb-14	Greece	Diesel Electric	TZ Mk. III	4	Portfolio
Maran Gas Efessos	159,800	Acrogiali Shipping & Trading	Daewoo	Jun-14	Greece	DFDE	Membrane	4	Portfolio
Maran Gas Hector	174,000	Dylan Corp.	Hyundai Samho	Nov-16	Greece	Diesel/Gas-Electric	TZ Mk. III	4	Portfolio
Maran Gas Hydra	173,400	Hai Jiao 1802 Ltd.	Daewoo	Feb-19	Greece	ME-GI	GT NO 96	4	Sabine Pass
Maran Gas Leto	174,000	Cherise Maritime Ltd.	Hyundai Samho	Mar-16	Greece	DFDE	TZ Mk. III	4	Portfolio
Maran Gas Lindos	161,870	Olivia International Shpg Corp.	Daewoo	Jul-15	Greece	DFDE	Membrane	4	Punta Europa
Maran Gas Mystras	155,900	Blueskies Shipping Co. Ltd.	Daewoo	Aug-15	Greece	DFDE	Membrane	4	QCLNG
Maran Gas Olympias	174,000	Cygnus Enterprises Inc.	Daewoo	Feb-17	Greece	ME-GI	GT NO 96	4	Portfolio
Maran Gas Pericles	173,400	Anguilla Navigation Corp.	Hyundai Samho	Aug-16	Greece	DFDE	TZ Mk. III	4	Portfolio
Maran Gas Posidonia	161,870	Felicite Navigation Inc.	Hyundai Samho	May-14	Greece	DFDE	Membrane	4	Punta Europa
Maran Gas Psara	173,595	Highseas Shiptrade Co.	Daewoo	May-20	Greece	ME-GI	GT NO96	4	Portfolio
Maran Gas Roxana	174,000	Elisa International Ltd.	Daewoo	Jan-17	Greece	ME-GI	TZ Mk. III	4	Portfolio
Maran Gas Sparta	159,800	Lettuce Maritime Corp.	Hyundai Samho	Apr-15	Greece	DFDE	Membrane	4	QCLNG
Maran Gas Spetses	173,400	Hai Jiao 1801 Ltd.	Daewoo	Jul-18	Greece	ME-GI	TZ Mk. III Flex	4	GoM
Maran Gas Troy	155,000	Helianthus Navigation Corp. .	Daewoo	Sep-15	Greece	DFDE	Membrane	4	Data unavailable
Maran Gas Ulysses	173,400	Ariel Sails Navigation SA	Hyundai Samho	Jan-17	Greece	Diesel/Gas-Electric	TZ Mk. III	4	Portfolio
Maran Gas Vergina	174,000	Santa Lucia Enterprises Inc.	Daewoo	Dec-16	Greece	ME-GI	GT NO 96	4	Portfolio
Maria Energy	174,000	Canyon Trading Corp.	HHI	Sep-16	Liberia	Diesel/Gas-Electric	TZ Mk. III	4	Data unavailable
Marib Spirit	165,500	Membrane Shipping Ltd.	Samsung	Apr-08	Marshall Is.	Diesel/Gas-Electric	TZ Mk. III	4	Balhaf
Marshal Vasilevskiy	170,000	Gazprom Flot LLC	HHI	Jan-19	Russian Fed.	Diesel/Gas-Electric	Membrane	4	Kaliningrad LNG
Marvel Crane	177,000	Rosewood Shipping Pte Ltd.	Mitsubishi	Mar-19	Singapore	STaGE	Moss	4	Cameron
Marvel Eagle	155,000	Mevius Lines SA	Kawasaki	Oct-18	Panama	Reheat Steam Turbine	Moss	4	Cameron
Marvel Falcon	174,000	Tea Tree Shipping Pte Ltd.	Samsung	Apr-18	Singapore	TFDE	TZ Mk. III Flex	4	Cameron
Marvel Hawk	177,000	Comet Arrow Gas Transport	Samsung	Dec-18	Singapore	TFDE	TZ Mk. III Flex	4	Cameron
Marvel Heron	177,000	Heron Gas Shipping SA	Mitsubishi	Sep-19	Panama	STaGE	Moss	4	Cameron
Marvel Kite	177,000	Comet Gyro Gas Transport Pte	Samsung	Jan-19	Singapore	TFDE	TZ Mk. III Flex	4	Cameron
Marvel Pelican	156,265	Pelican Gas Shipping SA	Kawasaki	Dec-19	Panama	Reheat Steam Turbine	Moss	4	Cameron
Megara	173,400	Hai Jiao 1607 Ltd.	Daewoo	Jul-18	Bahamas	ME-GI	GT NO 96	4	Portfolio
Mekaines	266,000	Nakilat SHI 1695 Inc.	Samsung	Apr-09	Marshall Is.	DRL	TZ Mk. III	5	Qatargas III
Merchant	138,000	Ocean Tiger Shipping Ltd.	Samsung	Jul-03	Marshall Is.	Steam	TZ Mk. III	4	Portfolio
Meridian Spirit	165,500	Meridian Spirit Aps	Samsung	Jan-10	Denmark	Diesel/Gas-Electric	TZ Mk. III	4	Hammerfest
Mesaimeer	216,312	Nakilat HHI 1908 Inc.	HHI	Mar-09	Marshall Is.	Diesel	TZ Mk. III	4	Qatargas III
Methane Alison Victoria	145,000	Gas-Nineteen Ltd.	Samsung	Apr-07	Bermuda	Steam	TZ Mk. III	4	Punta Europa
Methane Becki Anne	170,000	Gas-Twenty Seven Ltd.	Samsung	Sep-10	Bermuda	TFDE	TZ Mk. III	4	Singapore
Methane Heather Sally	145,000	Gas-Twenty One Ltd.	Samsung	Jan-07	Bermuda	Steam	TZ Mk. III	4	Punta Europa
Methane Jane Elizabeth	145,000	Gas-Seventeen Ltd.	Samsung	Jun-06	Bermuda	Steam	TZ Mk. III	4	Idku
Methane Julia Louise	170,000	Southern Route Maritime SA	Samsung	Apr-10	Bermuda	TFDE	TZ Mk. III	9	Singapore
Methane Kari Elin	138,267	Lombard Corporate December 1	Samsung	May-04	Bermuda	Steam	TZ Mk. III	4	Singapore
Methane Lydon Volney	145,000	Gas-Eighteen Ltd.	Samsung	Aug-06	Bermuda	Steam	TZ Mk. III	4	Idku
Methane Mickie Harper	170,000	Methane Services Ltd.	Samsung	Dec-10	Bermuda	Diesel/Gas-Electric	TZ Mk. III	4	Singapore
Methane Nile Eagle	145,000	Egypt LNG Shipping Ltd.	Samsung	Dec-07	Bermuda	Steam	TZ Mk. III	4	Idku
Methane Patricia Camila	170,000	Methane Services Ltd.	Samsung	Oct-10	Bermuda	TFDE	TZ Mk. III	4	Singapore
Methane Princess	138,000	Methane Services Ltd.	Daewoo	Aug-03	Bermuda	Steam	GT NO 96	4	Portfolio
Methane Rita Andrea	145,000	Gas-Sixteen Ltd.	Samsung	Apr-06	Bermuda	Steam	TZ Mk. III	4	Idku
Methane Shirley Elisabeth	145,000	Gas-Twenty Ltd.	Samsung	Feb-07	Bermuda	Steam	TZ Mk. III	4	Punta Europa
Methane Spirit	165,500	Methane Spirit LLC	Samsung	Feb-08	Bahamas	Diesel/Gas-Electric	TZ Mk. III	4	Atlantic LNG
Milaha Qatar	145,500	Milaha Qatar GmbH & Co. KG	Samsung	Apr-06	Malta	Steam	TZ Mk. III	4	RasGas II
Milaha Ras Laffan	138,270	Milaha Ras Laffan GmbH & Co.	Samsung	Apr-04	Malta	Steam	TZ Mk. III	4	RasGas II
Minerva Kalymnos	174,000	Koje Shipping	Samsung	Feb-21	Malta	X-DF	TZ Mk. III Flex Plus	4	Portfolio
Minerva Psara	173,400	Wimbledon Shipping	Daewoo	Jan-21	Malta	ME-GI	TZ Mk. III Flex Plus	4	Portfolio
Min Lu	147,100	Min Lu LNG Shipping Co. Ltd.	Hudong Zhonghua	Aug-09	Hong Kong	Steam	GT NO 96	4	Tangguh
Min Rong	145,000	Min Rong LNG Shipping Co. Ltd.	Hudong Zhonghua	Feb-09	Hong Kong	Steam	GT NO 96	4	Tangguh
Mozah	266,000	Nakilat Haloul Inc.	Samsung	Aug-09	Marshall Is.	Diesel	TZ Mk. III	5	Qatargas II
Mraweh	137,000	Mraweh Ltd.	STX	Apr-96	Liberia	Steam	Moss	4	Das Island
Mubaraz	137,000	Mubaraz Ltd.	STX	Dec-95	Liberia	Steam	Moss	4	Das Island
Murex	173,400	Hai Jiao 1605 Ltd.	Daewoo	Jul-17	Bahamas	ME-GI	GT NO 96	4	Portfolio
Murwab	210,100	J5 Nakilat No. 4 Ltd.	Daewoo	Jun-08	Marshall Is.	Diesel	GT NO 96	18	RasGas III
Myrina	173,400	Xiang Ch1 HK International	Daewoo	May-18	Bahamas	ME-GI	GT NO 96	4	Portfolio
Neo Energy	150,000	Sea Optima SA	HHI	Jan-07	Liberia	Steam	Moss	4	Portfolio
Neptune	145,130	SRV Joint Gas Ltd.	Samsung	Nov-09	Norway	DFDE	TZ Mk. III	4	Portfolio
Nikolay Urvantsev	172,658	Dy Maritime Ltd.	Daewoo	Jul-19	Hong Kong	ME-GI	GT NO 96 GW	4	Yamal
Nikolay Yevgenov	172,410	TC LNG Explorer III LLC	Daewoo	Apr-19	Bahamas	ME-GI	GT NO 96 GW	4	Yamal
Nikolay Zubov	172,410	Hai Kuo Shipping 1606 Ltd.	Daewoo	Nov-18	Cyprus	TFDE - Azipod	GT NO 96 GW	4	Yamal
Nizwa LNG	147,684	Oryx LNG Carrier SA	Kawasaki	Dec-05	Panama	Steam	Moss	4	Oman LNG
Nohshu Maru	180,000	Trans Pacific Shipping 5 Ltd.	Mitsubishi	Feb-19	Bahamas	Reheat Steam Turbine	Moss	4	Data unavailable
Northwest Sanderling	127,525	BHP/BP/Chevron/Japan & Others	Mitsubishi	Jan-89	Australia	Steam	Moss	4	North West Shelf



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Northwest Sandpiper	125,042	BHP/BP/Chevron/Japan & Others	Mitsui E&S	Jan-93	Australia	Steam	Moss	4	North West Shelf
Northwest Snipe	127,500	BHP/BP/Chevron/Japan & Others	Mitsui E&S	Jan-90	Australia	Steam	Moss	4	North West Shelf
Northwest Stormpetrel	127,500	BHP/BP/Chevron/Japan & Others	Mitsubishi	Dec-94	Australia	Steam	Moss	4	North West Shelf
Oak Spirit	173,400	Sea 64 Leasing Co Ltd.	Daewoo	Mar-16	Bahamas	ME-GI	GT NO 96	4	Sabine Pass
Ob River	149,700	Lance Shipping SA	HHI	May-07	Marshall Is.	Steam	TZ Mk. III	4	Sakhalin II
Oceanic Breeze	155,300	Oceanic Breeze LNG Transport	Mitsubishi	Apr-18	Marshall Is.	Reheat Steam Turbine	Moss	4	Ichthys
Onaiza	210,150	Nakilat DSME 2266 Inc.	Daewoo	Apr-09	Marshall Is.	Diesel	GT NO 96	12	Qatargas III
Ougarta	170,000	Hyproc Shipping Co.	HHI	Mar-17	Algeria	DFDE	TZ Mk. III Flex	4	Arzew
Pacific Arcadia	145,400	Bahamas LNG Shipping Ltd.	Mitsubishi	Oct-14	Bahamas	Steam	Moss	4	PNG LNG
Pacific Breeze	180,000	Pacific Breeze LNG Transport	Kawasaki	Mar-18	Marshall Is.	TFDE	Moss	4	Ichthys
Pacific Enlighten	145,400	Pacific Hope Shipping Ltd.	Mitsubishi	Mar-09	Bahamas	Steam	Moss	4	North West Shelf
Pacific Eurus	137,000	Pacific Eurus Shipping	Mitsubishi	Mar-06	Bahamas	Steam	Moss	4	Das Island
Pacific Mimosa	155,300	Kaede Shipholding SA	Mitsubishi	Mar-18	Japan	Reheat Steam Turbine	Moss	4	Wheatstone
Pacific Notus	137,006	Pacific LNG Shipping	Mitsubishi	Sep-03	Bahamas	Steam	Moss	5	Darwin LNG
Palu LNG	159,800	Oceanus LNG Gamma LLC	Daewoo	Nov-14	Malta	TFDE	GT NO 96	4	Spot
Pan Africa	174,000	Pan Africa LNG Transportation	Hudong Zhonghua	Jan-19	Hong Kong	TFDE	GT NO 96	4	QCLNG
Pan Americas	174,000	Pan Americas LNG Trans	Hudong Zhonghua	Jan-18	Hong Kong	TFDE	GT NO 96	4	QCLNG
Pan Asia	174,000	Pan Asia LNG Transportation	Hudong Zhonghua	Sep-17	Hong Kong	TFDE	GT NO 96	4	QCLNG
Pan Europe	174,000	Pan Europe LNG Transportation	Hudong Zhonghua	Jul-18	Hong Kong	TFDE	GT NO 96	4	QCLNG
Papua	170,000	Aquarius LNG Shipping Ltd.	Hudong Zhonghua	Nov-14	Hong Kong	DFDE	TZ MK. III	4	PNG LNG
Patris	174,000	Artemis Gas 1 Shipping Inc.	Daewoo	Jan-18	Liberia	ME-GI	GT NO 96	4	Freeport
Pearl LNG	174,000	Cardiff LNG Delta Owning LLC	HHI	Aug-20	Malta	X-DF	NO-96-GW+PRS	4	Portfolio
Point Fortin	154,200	Los Halillos Shipping Co. SA	Koyo Dockyard	Jan-10	Panama	Steam	TZ Mk. III	4	Portfolio
Polar Spirit	89,800	Polar Spirit LLC	Ishikawajima	Jun-93	Bahamas	Steam	IHI SPB	4	Atlantic LNG
Portovyy	138,107	Global LNG Ltd.	Daewoo	Aug-03	Malta	Steam	GT NO 96	4	Portfolio
Prachi	162,000	India LNG Transport Co. No. 4	HHI	Nov-16	Singapore	Diesel/Gas-Electric	TZ Mk. III	4	Gorgon
Prism Agility	180,000	HHI ENS1 Shipholding SA	HHI	May-19	Panama	X-DF	TZ Mk. III Flex Plus	4	Portfolio
Prism Brilliance	180,000	HHI ENS2 Shipholding SA	HHI	May-19	Panama	X-DF	TZ Mk. III Flex Plus	4	Portfolio
Pskov	170,200	Scalpay Shipping Ltd.	STX	Sep-14	Liberia	DFDE	GT NO 96	4	Portfolio
Puteri Delima	130,400	Puteri Delima Sdn Bhd.	STX	Jan-95	Malaysia	Steam	GT NO 96	4	MLNG II
Puteri Delima Satu	137,100	Puteri Delima Satu L Pte Ltd.	Mitsui E&S	Oct-02	Malaysia	Steam	GT NO 96	4	MLNG III
Puteri Firus Satu	137,100	Puteri Firus Satu	Mitsubishi	Aug-04	Malaysia	Steam	GT NO 96	4	MLNG III
Puteri Intan	137,100	Puteri Intan Sdn Bhd.	STX	Aug-94	Malaysia	Steam	GT NO 96	4	MLNG II
Puteri Intan Satu	137,100	Puteri Intan Satu L Pte Ltd.	Mitsubishi	Aug-02	Malaysia	Steam	GT NO 96	4	MLNG III
Puteri Mutiara Satu	137,100	Puteri Mutiara Satu	Mitsui E&S	Apr-05	Malaysia	Steam	GT NO 96	4	MLNG III
Puteri Nilam	130,400	Puteri Nilam Sdn Bhd.	STX	Jul-95	Malaysia	Steam	GT NO 96	4	MLNG II
Puteri Nilam Satu	137,100	Puteri Nilam Satu L Pte Ltd.	Mitsubishi	Jul-03	Malaysia	Steam	GT NO 96	4	MLNG III
Puteri Zamrud	130,400	MISC Bhd.	STX	Jun-96	Malaysia	Steam	GT NO 96	4	MLNG II
Puteri Zamrud Satu	137,100	Puteri Zamrud Satu L Pvt Ltd.	Mitsui E&S	Feb-04	Malaysia	Steam	GT NO 96	4	MLNG III
Qogir	174,000	Xiang Ch15 HK International	Samsung	Jun-20	Malta	X-DF	TZ MK. III Flex	4	Portfolio
Raahi	138,076	India LNG Transport Co. No. 2	Daewoo	Oct-04	Malta	Steam	GT NO 96	4	RasGas
Ramdane Abane	126,130	Hyproc Shipping Co.	STX	Jun-81	Algeria	Steam	GT NO 85	5	Arzew
Rasheeda	266,000	Nakilat SHI 1754 Inc.	Samsung	Aug-10	Marshall Is.	Diesel	TZ Mk. III	10	Qatargas IV
Rias Baixas Knutsen	180,000	Knutsen OAS Espana SL	HHI	Sep-19	Spain	ME-GI	TZ Mk. III Flex Plus	4	Corpus Christi
Ribera Del Duero Knutsen	173,400	Norspan LNG VIII AS	Daewoo	Dec-10	Norway	DFDE	GT NO 96	4	Portfolio
Rioja Knutsen	170,000	Norspan LNG X As	HHI	Dec-16	Spain	ME-GI	TZ Mk. III	4	Portfolio
Rudolf Samoylovich	172,410	TC LNG Explorer II LLC	Daewoo	Aug-18	Bahamas	ME-GI	GT NO 96 GW	4	Yamal
Saga Dawn	45,000	Saga LNG Shipping Pte Ltd.	China Merchants H.I.	Aug-19	Singapore	Diesel/Gas-Electric	TZ MK. III Flex	4	Data unavailable
Salalah LNG	147,000	Tiwi LNG Carrier SA	Samsung	Dec-05	Panama	Steam	TZ Mk. III	4	Oman LNG
SCF Barents	174,000	Heliconia Maritime SA	HHI	Sep-20	Liberia	DFDS	TZ Mk. III Flex	4	Portfolio
SCF La Perouse	174,000	Albus Shipping Ltd.	HHI	Feb-20	Liberia	X-DF	NO-96-GW+PRS	4	Portfolio
SCF Melampus	170,200	Pabbay Shipping Ltd.	STX	Jan-15	Liberia	Diesel Electric	Membrane	4	Portfolio
SCF Mitre	170,200	Ensay Shipping Ltd.	STX	Apr-15	Liberia	Diesel Electric	Membrane	4	Portfolio
SCF Timmerman	170,551	Sovcomflot	HHI	Jan-21	Liberia	X-DF	NO-96-GW+PRS	4	Portfolio
Sean Spirit	174,162	HHI Hull No. S856 LLC	Hyundai Samho	Dec-18	Bahamas	ME-GI	TZ Mk. III Flex	4	Freeport
Seishu Maru	138,000	Trans Pacific Shipping 1 Ltd.	Mitsubishi	Sep-14	Bahamas	Steam	Moss	4	PNG LNG
Senshu Maru	127,167	Nippon/Mitsui/Kawasaki	Mitsui E&S	Feb-84	Japan	Steam	Moss	5	Bontang
Seri Alam	145,572	MISC Bhd.	Samsung	Jul-05	Malaysia	Steam	Moss Seri-C	4	Bintulu
Seri Amanah	145,709	MISC Bhd.	Samsung	Mar-06	Malaysia	Steam	TZ Mk. III	4	Bintulu
Seri Anggun	145,731	MISC Bhd.	Samsung	Oct-06	Malaysia	Steam	TZ Mk. III	4	North West Shelf
Seri Angkasa	145,130	MISC Bhd.	Samsung	Dec-06	Malaysia	Steam	TZ Mk. III	4	Bintulu
Seri Ayu	145,894	MISC Bhd.	Samsung	Oct-07	Malaysia	Steam	TZ Mk. III	4	Bintulu
Seri Bakti	152,944	MISC Bhd.	Mitsubishi	Apr-07	Malaysia	Steam	TZ MK. III	4	Gladstone
Seri Balhaf	152,000	MISC Bhd.	Mitsubishi	Jan-09	Malaysia	Steam	TZ MK. III	4	Bontang
Seri Balqis	152,000	MISC Bhd.	Mitsubishi	Mar-09	Malaysia	Steam	TZ MK. III	4	NLNG
Seri Begawan	152,900	MISC Bhd.	Mitsubishi	Nov-07	Malaysia	Steam	TZ MK. III	4	Bintulu
Seri Bijaksana	152,300	MISC Bhd.	Mitsubishi	Apr-08	Malaysia	Steam	TZ MK. III	4	Bintulu
Seri Camar	150,000	Seri Camar L Pte Ltd.	HHI	Feb-18	Malaysia	Ultra Steam Turbine	Moss	4	Pacific Northwest



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Seri Camellia	159,800	Seri Camellia L Pte Ltd.	HHI	Sep-16	Malaysia	Steam	Moss Seri-C	4	Pacific Northwest
Seri Cemara	150,200	Seri Cemara L Pte Ltd.	HHI	Apr-18	Malaysia	Reheat Steam Turbine	Moss	4	Portfolio
Seri Cempaka	162,000	Seri Cempaka L Pte Ltd.	HHI	Aug-17	Malaysia	Steam	Moss Seri-C	4	Pacific Northwest
Seri Cenderawasih	162,000	Seri Cenderawasih L Pvt Ltd.	HHI	Feb-17	Malaysia	Steam	Moss Seri-C	4	Pacific Northwest
Sestao Knutsen	136,947	Norspan LNG IV AS	Navantia Cadiz	Oct-07	Spain	Steam	TZ Mk. III	4	Portfolio
Sevilla Knutsen	173,400	Norspan LNG VI AS	Daewoo	May-10	Spain	Diesel/Gas-Electric	GT NO 96	4	Portfolio
Shagra	268,000	Nakilat SHI 1751 Inc.	Samsung	Nov-09	Marshall Is.	Diesel	TZ Mk. III	10	Qatargas IV
Shahamah	135,496	Shahamah Inc.	Kawasaki	Oct-94	Liberia	Steam	Moss	5	Das Island
Shen Hai	147,200	Shanghai LNG Shipping Co. Ltd.	Hudong Zhonghua	Dec-12	Hong Kong	Steam	TZ Mk. III	4	Bintulu
Shinshu Maru	180,000	Trans Pacific Shipping 7 Ltd.	Kawasaki	Feb-19	Bahamas	DERST	Moss	4	Freeport
Simaisma	145,889	Greenwell Corp.	Daewoo	Jul-06	Greece	Steam	GT NO 96	8	RasGas II
Singapore Energy	138,000	KSF Global No. 6 SA	Samsung	Feb-03	Marshall Is.	Steam	TZ Mk. III	4	Portfolio
SK Audace	174,000	Milestone LNG Transport SA	Samsung	Aug-17	Panama	X-DF	TZ Mk. III	4	Portfolio
SK Resolute	180,000	Great Shale LNG Transport SA	Samsung	Nov-17	Panama	X-DF	TZ Mk. III	4	Ichthys
SK Serenity	174,000	Shikc 1 Shipholding SA	Samsung	Feb-18	Panama	TFDE	KC-1	4	Sabine Pass
SK Spica	174,117	Shikc 2 Shipholding SA	Samsung	Mar-18	Panama	TFDE	KC-1	4	Sabine Pass
SK Splendor	138,370	SK Shipping Co. Ltd. -Krs	Samsung	May-00	South Korea	Steam	TZ Mk. III	4	Oman LNG
SK Stellar	138,375	Stellar Shipholding SA	Samsung	Dec-00	Panama	Steam	TZ Mk. III	4	RasGas I
SK Summit	138,003	SK Shipping Co. Ltd. -Krs	Daewoo	Aug-99	South Korea	Steam	GT NO 96	4	RasGas I
SK Sunrise	138,306	Methane Navigation SA	Samsung	Aug-03	Panama	Steam	TZ Mk. III	4	RasGas II
SK Supreme	138,225	SK Shipping Co. Ltd. -Krs	Samsung	Feb-00	South Korea	Steam	TZ Mk. III	4	RasGas I
SM Eagle	174,000	SMKLC LNG1 SA	Daewoo	May-17	Panama	ME-GI	TZ Mk. III Flex	4	Sabine Pass
SM Seahawk	174,000	SMKLC LNG2 SA	Daewoo	Jun-17	Panama	ME-GI	TZ Mk. III Flex	4	Sabine Pass
Sohar LNG	137,248	Energy Spring LNG Carrier SA	Mitsubishi	Oct-01	Panama	Steam	Moss	5	Oman LNG
Sohshu Maru	177,000	Trans Pacific Shipping 8 Ltd.	Kawasaki	Jul-19	Bahamas	DERST	Moss	4	Freeport
Solaris	155,000	Gas-Eight Ltd.	Samsung	Jul-14	Bermuda	Diesel/Gas-Electric	Membrane	4	Spot
Sonangol Benguela	160,500	Sonangol Benguela Ltd.	Daewoo	Dec-11	Bahamas	Steam	GT NO 96	4	Soyo
Sonangol Etosha	160,500	Sonangol Etosha Ltd.	Daewoo	Sep-11	Bahamas	Steam	GT NO 96	4	Soyo
Sonangol Sambizanga	160,500	Sonangol Sambizanga Ltd.	Daewoo	Aug-11	Bahamas	Steam	GT NO 96	4	Soyo
Southern Cross	172,000	Aries LNG Shipping Ltd.	Hudong Zhonghua	Jul-15	Hong Kong	DRL	TZ Mk. III	4	PNG LNG
Soyo	160,276	Mint LNG I Ltd.	Samsung	Aug-11	Bahamas	DFDE	TZ Mk. III	4	Soyo
Spirit Of Hela	177,000	Nefertiti LNG Shipping Co. Ltd.	Hyundai Samho	Nov-10	Bahamas	Diesel Electric	TZ Mk. III	4	PNG LNG
Stena Blue SKY	145,700	Blue Shipping KB	Daewoo	Aug-06	U.K.	Steam	GT NO 96	4	Spot
Stena Clear Sky	171,800	Clear Sky KB	Daewoo	May-11	U.K.	Diesel/Gas-Electric	GT NO 96	4	Portfolio
Stena Crystal SKY	171,800	Crystal Sky KB	Daewoo	May-11	U.K.	Diesel/Gas-Electric	GT NO 96	4	Portfolio
Symphonic Breeze	145,394	Reborn Maritime SA	Kawasaki	Dec-07	Bahamas	Steam	Moss	4	Portfolio
Taitar No. 1	145,000	NIMIC No. 1 SA	Mitsubishi	Oct-09	Panama	Steam	Moss	4	RasGas
Taitar No. 2	145,000	NIMIC No. 2 SA	Kawasaki	Dec-09	Panama	Steam	Moss	4	RasGas
Taitar No. 3	145,000	NIMIC No. 3 SA	Mitsubishi	Dec-09	Panama	Steam	Moss	4	RasGas
Taitar No. 4	147,000	NIMIC No. 4 SA	Kawasaki	Aug-10	Panama	Steam	Moss	4	RasGas
Tangguh Batur	145,700	LNG North-South Shipping Co.	Daewoo	Dec-08	Singapore	Steam	TZ Mk. III	4	Tangguh
Tangguh Foja	155,000	Ocean1919 Shipping No. 1 SA	Samsung	Nov-08	Panama	DFDE	TZ Mk. III	4	Tangguh
Tangguh Hiri	155,000	Tangguh Hiri Finance Ltd.	HHI	Dec-08	Bahamas	DFDE	TZ Mk. III	4	Tangguh
Tangguh Jaya	155,000	Ocean1919 Shipping No. 2 SA	Samsung	Dec-08	Panama	DFDE	TZ Mk. III	4	Tangguh
Tangguh Palung	155,000	Ocean1919 Shipping No. 3 SA	Samsung	Mar-09	Panama	DFDE	TZ Mk. III	4	Tangguh
Tangguh Sago	155,000	Tangguh Sago Finance Ltd.	Hyundai Samho	Dec-08	Bahamas	Diesel/Gas-Electric	TZ Mk. III	4	Tangguh
Tangguh Towuti	145,700	LNG East-West Ship Singapore	Daewoo	Oct-08	Singapore	Steam	TZ Mk. III	4	Tangguh
Tembek	216,200	Overseas LNG S1 Corp.	Samsung	Nov-07	Marshall Is.	Diesel	TZ Mk. III	4	Qatargas II
Tessala	170,000	Hyproc Shipping Co.	HHI	Feb-17	Algeria	Diesel/Gas-Electric	TZ Mk. III Flex	4	Arzew
Torben Spirit	173,400	Sea 168 Leasing Co. Ltd.	Daewoo	Nov-16	Bahamas	ME-GI	GT NO 96	4	Portfolio
Trader	138,000	Lloyds Industrial Leasing	Samsung	Nov-02	Isle of Man	Steam	TZ Mk. III	4	Portfolio
Traiano Knutsen	180,000	Hai Kuo Shipping 1901 G Ltd.	HHI	Jul-20	Norway	ME-GI	TZ Mk. III Flex Plus	4	Portfolio
Trinity Arrow	154,982	Cypress/Luster/Los Halillos	Koyo Dockyard	Feb-08	Panama	Steam	TZ Mk. III	4	Portfolio
Trinity Glory	154,000	Cypress/Luster/Los Halillos	Koyo Dockyard	Nov-08	Panama	Steam	TZ Mk. III	4	Bontang
Tristar Ruby	155,000	Sg Leasing Gems Ltd.	HHI	Apr-08	Liberia	Diesel/Gas-Electric	TZ Mk. III	4	Portfolio
Umm Al Amad	210,200	J5 Nakilat No. 7 Ltd.	Daewoo	Sep-08	Marshall Is.	Diesel	GT NO 96	18	RasGas III
Umm Al Ashtan	137,000	Umm Al Ashtan Ltd.	STX	May-97	Liberia	Steam	Moss	4	Das Island
Umm Bab	145,000	Sea Trade International	Daewoo	Nov-05	Greece	Steam	GT NO 96	4	RasGas II
Umm Slal	266,000	Shi Hull No. 1676 Inc.	Samsung	Nov-08	Marshall Is.	DFDE	TZ Mk. III	5	Qatargas II
Valencia Knutsen	173,400	Norspan LNG VII AS	Daewoo	Sep-10	Spain	DFDE	GT NO 96	4	Portfolio
Velikiy Novgorod	170,200	Boreray Shipping Ltd.	STX	Dec-13	Liberia	DFDE	GT NO 96	4	Portfolio
Vivit Americas LNG	180,000	Cardiff LNG Zeta Owning LLC	HHI	Oct-20	Malta	X-DF	TZ Mk. III Flex	4	Portfolio
Vladimir Rusanov	174,000	DY Maritime Ltd.	Daewoo	Jan-18	Hong Kong	ME-GI	GT NO 96 GW	4	Yamal
Vladimir Vize	172,000	Dy Maritime Ltd.	Daewoo	Sep-18	Hong Kong	ME-GI	GT NO 96 GW	4	Yamal
Vladimir Voronin	172,652	TC LNG Explorer IV LLC	Daewoo	Jul-19	Bahamas	ME-GI	GT NO 96 GW	4	Yamal
Wilforce	155,900	Compass Shipping 84 Corp. Ltd.	Daewoo	Sep-13	Norway	DFDE	GT NO 96	4	Data unavailable
Wilpride	155,900	Compass Shipping 85 Corp. Ltd.	Daewoo	Nov-13	Norway	DFDE	GT NO 96	4	N/A
Woodside Chaney	174,000	Lamkos Seaways Ltd.	Daewoo	Jul-19	Greece	ME-GI	TZ Mk. III Flex	4	Portfolio



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Woodside Charles Allen	173,400	Newberry Shiptrade Ltd.	Daewoo	Oct-20	Greece	ME-GI	Membrane	4	Portfolio
Woodside Donaldson	165,500	Malt Singapore Pte Ltd.	Samsung	Oct-09	Singapore	Diesel/Gas-Electric	TZ Mk. III	4	Pluto
Woodside Goode	159,800	Armour Co. Ltd.	Daewoo	Nov-13	Greece	Diesel Electric	GT NO 96	4	RasGas
Woodside Rees Withers	173,400	Franklin Navigation Co.	Daewoo	Oct-19	Greece	ME-GI	GT NO 96	4	Data unavailable
Woodside Rogers	159,800	Margie Seaway Corp.	Daewoo	Jul-13	Greece	Diesel/Gas-Electric	GT NO 96	4	Pluto
Yakov Gakkel	172,658	TC LNG Explorer VI LLC	Daewoo	Nov-19	Bahamas	ME-GI	GT NO 96 GW	4	Yamal
Yamal Spirit	174,000	Xiang Ch2 HK International	Hyundai Samho	Jan-19	Bahamas	ME-GI	TZ Mk. III Flex	4	Freeport
Yari LNG	159,800	Oceanus LNG Delta LLC	Daewoo	Nov-14	Malta	TFDE	GT NO 96	4	Spot
Yenisei River	155,000	Navajo Marine Ltd.	HHI	Jul-13	Marshall Is.	DFDE	TZ Mk. III	4	Yamal
YK Sovereign	127,125	SK Shipping Co. Ltd. -Krs	HHI	Dec-94	South Korea Steam		Moss	4	MLNG
Zarga	268,000	Nakilat SHI 1752 Inc.	Samsung	Jan-10	Marshall Is.	DRL	TZ Mk. III	5	Qatargas IV
Zekreet	137,482	Mitsui/Nippon/Kawasaki/Iino	Mitsui E&S	Dec-98	Japan	Steam	Moss	5	Qatargas I

Fleet – LNG Bunkering

Name	Built	Capacity	Registered Owner	Builder	Flag	Engine Type	Cargo System	No. of tanks	Project
Seagas	Sep-74	170	Linde Gas AB	Havyard Leirvik	Sweden	Diesel	Cylinder	1	Stockholm Viking Line
Coral Methane	Apr-09	7,551	Coral Methane Shipping BV	AVIC Dingheng	Netherlands	Gas-Diesel	Cylinder	4	Portfolio
Oizmendi	Jul-09	600	Itsas Gas Bunker Supply SL	Astilleros Zamakona	Spain	Diesel	Cylinder	2	Huelva
Green Zeebrugge	Feb-17	5,000	LNG Link Investment AS	Hanjin Heavy Industries	Belgium	Diesel/Gas-Electric	Cylinder	2	Zeebrugge
Cardissa	Jun-17	6,500	Shell Western LNG BV	STX	Netherlands	Diesel/Gas-Electric	Cylinder	1	Portfolio
Coralius	Aug-17	5,800	Sirius Veder Gas AB	Bodewes Shipyards	Sweden	DFDE	Cylinder	4	Portfolio
Kairos	Oct-18	7,500	Uranos Vermogensverwaltung	Hyundai Mipo	Cyprus	Gas-Diesel	Type C	4	Portfolio
Bunker Breeze	Oct-18	6,050	Molucas Naviera AIE	Astilleros Zamakona	Spain	Gas-Diesel	Cylinder	4	Algeciras
LNG London	Apr-19	3,000	LNG Shipping S.A.	Severnav S.A.	Belgium	LNGPac	Cylinder	6	ARA
SM Jeju LNG 1	Sep-19	7,500	Jeju LNG 1 S.A.	Samsung	Panama	Diesel/Gas-Electric	KC-1	1	Portfolio
SM Jeju LNG 2	Jan-20	7,500	Jeju LNG 2 S.A.	Samsung	Panama	Diesel/Gas-Electric	KC-1	1	Portfolio
Gas Agility	Apr-20	18,600	Emerald Green Maritime Ltd.	Hudong Zhonghua	Malta	DFDE	TZ Mk III Flex 2		Rotterdam
Kaguya	Sep-20	3,469	Central LNG Shipping Japan	Kawasaki	Japan	Gas-Diesel	Cylinder	1	JERA TPS
Avenir Advantage	Oct-20	7,500	Avenir L Pte Ltd.	Keppel Nantong	Malta	Gas-Diesel	Type C	2	Portfolio
Avenir Accolade	Nov-20	7,500	Stolt-Nielsen Gas Ltd.	Keppel Nantong	Malta	Gas-Diesel	Type C	2	Portfolio
FueLNG Bellina	Nov-20	7,500	FueLNG Pte Ltd.	Kappel Nantong	Singapore	Diesel/Gas-Electric	Cylinder	2	Portfolio
Dalian No. 1	Dec-20	8,330	Xinao Marine Shipping Co. Ltd.	Dalian Yard	China	Gas-Diesel	Cylinder	2	Portfolio
Marine Vicky	Jan-20	9,900	Sinanju Tankers Pte. Ltd.	Keppel Nantong	Singapore	Gas-Diesel	TBC	TBC	Portfolio
Imperial Gas 92	Oct-17	3,800	Imperial Logistics International BV & Co. KG	Centromost	Germany	Diesel	Cylinder	TBC	Portfolio
Imperial Gas 93	Nov-17	3,800	Imperial Logistics International BV & Co. KG	Centromost	Germany	Diesel	Cylinder	TBC	Portfolio

Fleet – Small-scale/Multipurpose

Name	Built	Capacity	Registered Owner	Builder	Flag	Engine Type	Cargo System	No. of tanks	Project
Akebono Maru	Jun-11	3,500	Chuo Kaiun K.K.	Higaki	Japan	Diesel	Cylinders	2	Japan coastal trade
Aman Sendai	May-97	18,928	Asia LNG Transport	NKK	Malaysia	Steam	TZ Mk. III	3	Malaysia LNG
Coral Acropora	Dec-12	6,573	Coral Acropora Shipping	AVIC Dingheng	Netherlands	Gas-Diesel	Cylinders	4	Portfolio
Coral Actinia	Jan-13	6,573	Coral Actinia Shipping	AVIC Dingheng	Netherlands	Gas-Diesel	Cylinders	4	Portfolio
Coral Alicia	Dec-12	6,573	Coral Alicia Shipping	AVIC Dingheng	Netherlands	Gas-Diesel	Cylinders	4	Portfolio
Coral Anthelia	May-13	6,500	Coral Anthelia Shipping	AVIC Dingheng	Netherlands	Gas-Diesel	Cylinders	4	Portfolio
Coral Energice	Feb-18	18,000	Anthony Veder Chartering	Neptun Werft	Netherlands	Gas-Diesel	TZ MK. III Flex 2		Portfolio
Coral Energy	Dec-12	15,600	Anthony Veder Rederijzaken	Meyer Werft	Netherlands	Gas-Diesel	IMO Type C	3	Portfolio
Coral Fraseri	Jan-10	10,000	Innovation Shipping Co.	Wuzhou Shipbuilding	Singapore	Diesel	Cylinders	2	Portfolio
Coral Furcata	Nov-11	10,000	Conception Shipping Company	Wuzhou Shipbuilding	Singapore	Diesel	Cylinders	2	Portfolio
Kakurei Maru	Nov-08	2,536	Tsurumi Sunmarine Co.	Higaki	Japan	Diesel	Cylinders	2	Japan coastal trade
Kakuyu Maru	Nov-13	2,538	Tsurumi Sunmarine Co.	Kawasaki	Japan	Diesel	Cylinders	1	Japan coastal trade
Lucia Ambition	Dec-93	18,927	Asia LNG Transport	NKK	Malaysia	Steam	TZ Mk. III	3	Malaysia-Hainan
Seoul Gas	Jul-98	4,365	Chemgas Schiffahrts GmbH & Co. mt Oste KG	Severnav Shipbuilding	Liberia	Diesel	Cylinders	2	S. Korea-China
Coral Favia	Jul-10	10,000	Somargas II Pvt. Ltd.	Wuzhou Shipbuilding	Singapore	Diesel	Cylinders	2	Baltic portfolio
Coral Fungia	Jan-11	10,000	Somargas II Pvt. Ltd.	Wuzhou Shipbuilding	Singapore	Diesel	Cylinders	2	Baltic portfolio
Unikum Spirit	Jun-11	12,000	DHJS Hull No.2007-001 LLC	AVIC Dingheng	Singapore	Diesel	Cylinders	2	Kuantan
North Pioneer	Nov-05	2,500	Japan Liquid & Gas Transport Co. & Japan Railway Agency	Shin Kurushima	Japan	Diesel	Cylinders	2	Japan coastal trade
Pioneer Knutsen	Mar-04	1,100	Knutsen Kyst LNG K/S	Bijlsma Lemmer B.V. Scheepswerf	Norway	LNG-Diesel	Cylinders	2	Norway coastal trade
Shinju Maru No. 1 trade	Aug-03	2,538	JRTT & NS United Coastal Tankers		Kawasaki	Japan	Diesel	Cylinders2	Japan coastal
Shinju Maru No. 2	Oct-08	2,536	Chuo Kaiun K.K.	Higaki	Japan	Diesel	Cylinders	2	Japan coastal trade
Sun Arrows	Sep-07	19,531	Maple LNG Transport Inc.	Kawasaki	Bahamas	Diesel	Moss	3	Malaysia LNG
Surya Aki	Feb-96	19,538	MCGC International Limited & Hiroshima Gas Co.	Kawasaki	Bahamas	Steam	Moss	3	Thanlyin LNG
Triputra	Dec-00	23,097	Nusantara Shipping	NKK	Indonesia	Steam	TZ Mk. III	3	Pertamina Portfolio
Vision Spirit	Sep-11	12,000	I.M. Skaugen Marine Services	AVIC Dingheng	Singapore	Diesel	Cylinders	2	Portfolio
Hai Yang Shi You 301	Apr-15	30,000	COSL	Jiangnan Shipyard	China	Gas-Diesel	Membrane	4	Hainan LNG shuttle

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

LNG Import Terminals

Explanatory Notes

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

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

Country	Location (Project)	Owners	Start up	Tanks	Storage Capacity
Belgium	Zeebrugge	Fluxys	1987	4	380,000
Canada	Canaport Saint John	Irving Oil, Repsol	2009	3	480,000
Chile	Quintero	ENAP, Metrogas, Enagas	2009	3	334,000
	Mejillones	Engie, 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
Jamaica	Montego Bay	New Fortress	2018	1	7,000
Japan	Negishi	Tokyo Gas	1969	14	1,180,000
	Sodegaura	Tokyo Gas JERA Co. Inc	1973	35	2,660,000
	Ohgishima	Tokyo Gas	1998	4	850,000
	Higashi-Ohgishima	JERA Co. Inc.	1984	9	540,000
	Futtsu	JERA Co. Inc.	1985	10	1,360,000
	Yokkaichi LNG	JERA Co. Inc.	1988	4	320,000
	Kawagoe	JERA Co. Inc.	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 - Midorihamma	Toho Gas	2001	3	600,000
	Senboku I	Osaka Gas	1972	4	180,000
	Senboku II	Osaka Gas	1977	18	1,585,000
	Himeji	Osaka Gas	1984	8	740,000
	Himeji LNG	Kansai Electric	1979	7	520,000
	Yanai	Chugoku Electric	1990	6	480,000
	Niigata	Nihonkai LNG, Tohoku Electric	1984	8	720,000
	Oita	Oita Gas, Kyushu Electric	1990	5	460,000
	Tobata	Kitakyushu LNG	1977	8	480,000
	Fukuoka	Saibu Gas	1993	2	70,000
	Sodeshi	Shizuoka Gas	1996	3	337,200
	Hatsukaichi	Hiroshima Gas	1996	2	170,000
	Kagoshima	Nippon Gas	1996	2	136,000
	Shin-Minato	Sendai City Gas	1997	1	80,000
	Nagasaki	Saibu Gas	2003	1	36,000
	Sakai	Kansai Electric, Cosmo Oil	2006	3	420,000
	Mizushima	Nippon Oil, Chugoku Electric	2006	2	320,000

LNG Import Terminals (continued)

Country	Location (Project)	Owners	Start up	Storage	
				Tanks	Capacity
Japan (continued)	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	JERA Co. Inc.	2011	3	540,000
	Hachinohe LNG	Nippon Oil	2015	2	280,000
	Hitachi LNG	Tokyo Gas	2015	1	230,000
Korea	Soma Fukushima	Japan Petroleum Exploration	2017	1	225,000
	Boryyeong	GS Energy, SK E&S	2017	3	200,000
	Incheon	Kogas	1996	20	2,880,000
	Kwangyang	POSCO SK E&S	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	Jeju	Kogas	2019	2	90,000
	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
Sweden	Lysekil	Gasum	2014	1	30,000
	Nynashamn	AGA Gas	2011	1	20,000
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
	Tianjin (Nangang)	Beijing Energy	2022	10	2,000,000
	Yangjiang	CNPC Yudean Power	2023	2	120,000
	Zhangzhou Fujian	CNOOC	2022	2	160,000
India	Dhamra Odisha	Indian Oil, Adani, GAIL	2020	2	320,000
	Jaigarh	Hiranandani Group	2021	2	320,000
	Kodinar	Hindustan Petroleum Corp.	2022	1	160,000
Japan	Himuka	Diagas Group-Osaka Gas	2022	1	65,000

LNG FSRU Import Facilities

Country	Location (Project)	Owners	Start up
Argentina	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
	Porto Sergipe FSRU	Golar LNG/Stonepeak	2020
	Porto do Acu FSRU	GNA	2020
China	Tianjin FSRU	CNOOC, Hoegh, various	2013
Croatia	Hrvatska LNG	MVM	2021
Colombia	Cartagena FSRU	Promigas, Sociedad Portuaria El Cayao	2016
Egypt	Ain Sokhna, Suez	EGAS, BW Gas	2015
Indonesia	Lampung	Hoegh LNG, PGN LNG	2014
	Nusantara (Jakarta Bay)	Golar LNG, Pertamina	2012
	Benoa LNG	PT Pertamina Niaga	2016
	Amurang	Karadeniz	2020
Israel	Hadera Gateway	Israel Electric	2013
Italy	Livorno	OLT Offshore LNG Toscana	2013
Jamaica	Old Harbour	Golar FSRU, New Fortress	2019
Jordan	Aqaba, Jordan	Golar LNG	2015
Kuwait	Mina Al-Ahmadi	KPC	2009
Lithuania	Klaipeda	Klaipeda Nafta Hoegh LNG	2014
Malaysia	Malacca FSRU	Petronas	2012
Malta	FSU Armada Mediterranea	ElectroGas	2016
Myanmar	Thanlyin	CNTIC Vpower	2020
Pakistan	Port Qasim	Excelerate, Engro Corp	2015
	Port Qasim	BW-Mitsui, PGP Consortium	2017
Russia	Kaliningrad FSRU	Gazprom	2020
Turkey	Aliaga FSRU, Turquoise FLNG	Etki LNG	2016
	Dortyol FSRU Challenger	Botas	2018
UAE	Ruwais, Abu Dhabi	Gasco (UAE)	2016
	Jebel Ali Port, Dubai	DSA (UAE)	2010

LNG Export Projects

Country	Location/Project	Project Developers	Planned Start Up	Number of Trains	Capacity In MTPA
AUSTRALIA	Pluto LNG expansion	Woodside	2021+	2	10.0
CANADA	Bear Head LNG, Nova Scotia	LNG Ltd.	2024	4	8.0
	Goldboro LNG, Nova Scotia	Pieridae Energy	2024	2	10.0
	Kitimat LNG, BC	Woodside, Chevron	2024	2	10.0
	LNG Canada, BC	Shell, Mitsubishi, Kogas, PetroChina, Petronas	2024	2	12.0
	Kwispaa FLNG, Vancouver	Steelhead LNG	2024	4	12.0
	Vancouver Tilbury	WesPac Midstream	2021	1	3.25
	Woodfibre LNG, Squamish	Pacific Oil & Gas Co	2020	2	2.1
EQ.GUINEA	Equatorial Guinea Fortuna FLNG	Ophir, Golar LNG, GEPetrol	2020+	1	2.0
INDONESIA	Sengkang LNG	Energy World Corp.	2019	4	2.0
MALAYSIA	Rotan FLNG (Sabah)	Petronas, Murphy Oil	2021	1	1.5
MOZAMBIQUE	Area 1 Onshore	Anadarko Petroleum and partners	2023+	2	10.0
	Area 4 Onshore	Eni and partners	2023+	2	10.0
	Area 4 FLNG	Eni and partners	2022	1	3.4
NIGERIA	NLNG Train 7	NNPC, Shell, Eni, Total	2022+	1	7.0
PAPUA NEW GUINEA	Elk-Antelope LNG	Total, ExxonMobil Oil Search, Petromin	Studies		
RUSSIA	Sakhalin II expansion	Gazprom, Shell, Mitsui, Mitsubishi	2021	studies	
	Vladisvostok LNG	Gazprom, Itochu, various	2023+	2	10.0
	Arctic LNG II Siberia	Novatek, Total	2023	3	19.8
USA	Alaska LNG Nikiski	Alaska Gasline Development Corp.	2023+	3	20.0
	Annova LNG, Brownsville	Exelon Corp.	2023+	6	6.0
	Commonwealth LNG, Louisiana	Commonwealth LNG LLP	2023+	8	9.0
	Delfin LNG, Louisiana	Delfin	2023+	3	9.0
	Driftwood LNG, Louisiana	Tellurian, Total and others	2023	6	27.6
	Galveston Bay LNG	NextDecade	2023+	6	27.0
	Golden Pass, Texas	Qatar Petroleum, ExxonMobil	2024	3	15.6
	Jacksonville, St John's River	Eagle LNG, Ferus Natural Gas Fuels	2021+	small	TBC
	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
AUSTRALIA	Karratha	NWS Woodside, Shell, BHP	1989	2	5.0	4	260,000
		(BP, Chevron	1992	1	2.5	1	130,000
		(Mitsubishi/Mitsui)	2004	1	4.4	1	130,000
		NWS partners	2008	1	4.4	1	130,000
	Darwin	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
			2007	1	4.2	2	280,000
NORWAY	Snøhvit/Melkoya	Equinor, Total, Petoro	2007	1	4.2	2	280,000
OMAN	Oman LNG	Oman Govt., Shell, Total, Korea LNG	2000	2	7.1	2	240,000
		Mitsubishi, Mitsui, Partex and Itochu					
		Oman Govt., Oman LNG Union Fenosa, Osaka Gas, & Itochu	2006	1	3.7	2	240,000
PAPUA NEW GUINEA	PNG LNG	ExxonMobil, Oil Search, Santos, JX Nippon Oil	2014	2	6.9	2	320,000
PERU	Peru LNG	Hunt Oil, Shell, Marubeni, SK Group	2010	1	4.4	2	260,000
QATAR	Qatargas 1-T1&2	QP, ExxonMobil, Total, Marubeni, Mitsui	1997	2	6.4	4	340,000
	Qatargas 1-T3	QP, ExxonMobil, Total, Marubeni, Mitsui	1999	1	3.1		
	Qatargas II-T1	QP, ExxonMobil	2009	1	7.8		
	Qatargas II-T2	QP, ExxonMobil, Total	2009	1	7.8	8	1,160,000
	Qatargas III-T1	QP, ConocoPhillips, Mitsui	2010	1	7.8		
	Qatargas IV-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

A young boy with dark hair, wearing a plaid shirt, is shown in profile, looking down at a tablet computer. The scene is dimly lit, with the light from the tablet illuminating his face and shirt. The background is dark, creating a focused and contemplative atmosphere.

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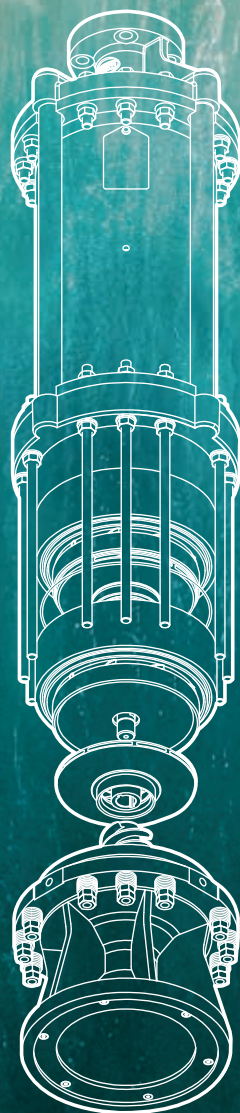
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